993

C. H. OSBORN.

INCUBATOR.

APPLICATION FILED JULY 15, 1914.

1,144,232.

Patented June 22, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

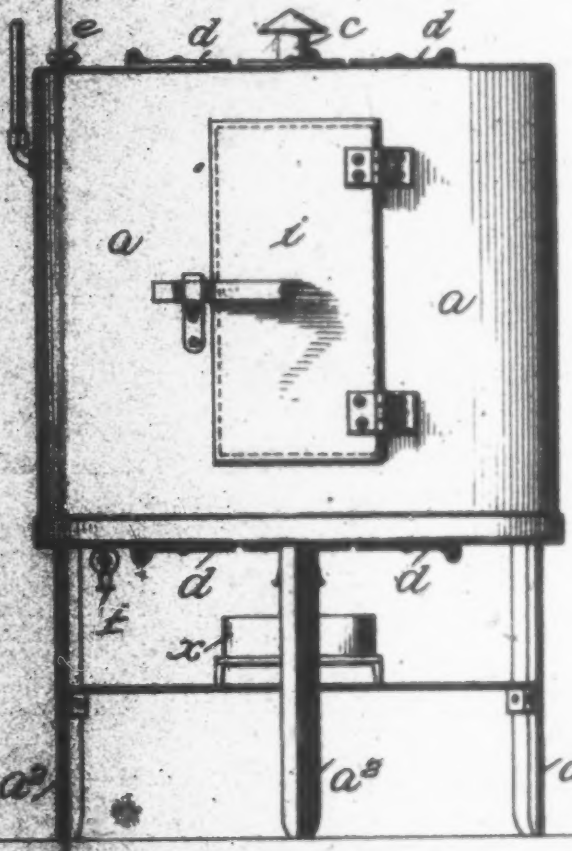
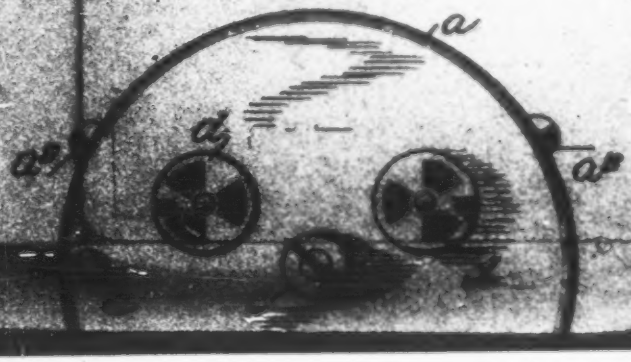


Fig. 2.



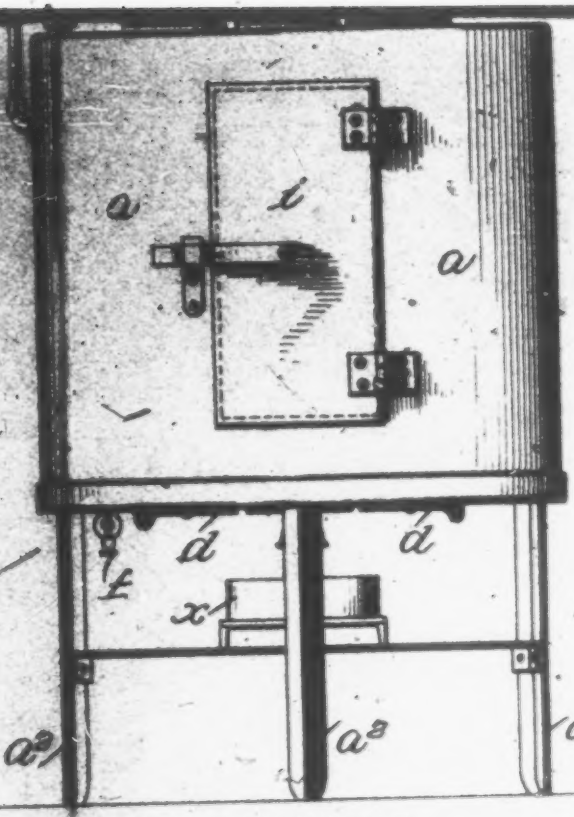
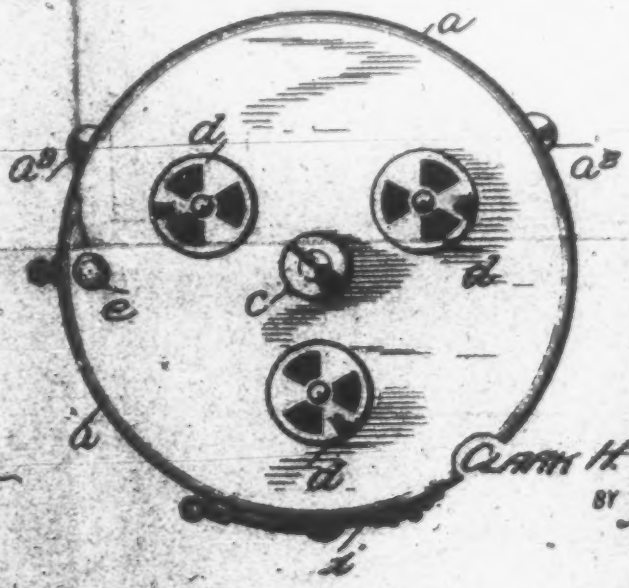


Fig. 2.



WITNESSES
[illegible]
H. C. Berk.

[illegible]
BY [illegible]
ATTY.

994

C. H. OSBORN.

INCUBATOR.

APPLICATION FILED JULY 15, 1914.

1,144,232.

Patented June 22, 1915.

2 SHEETS—SHEET 2.

Fig. 3.

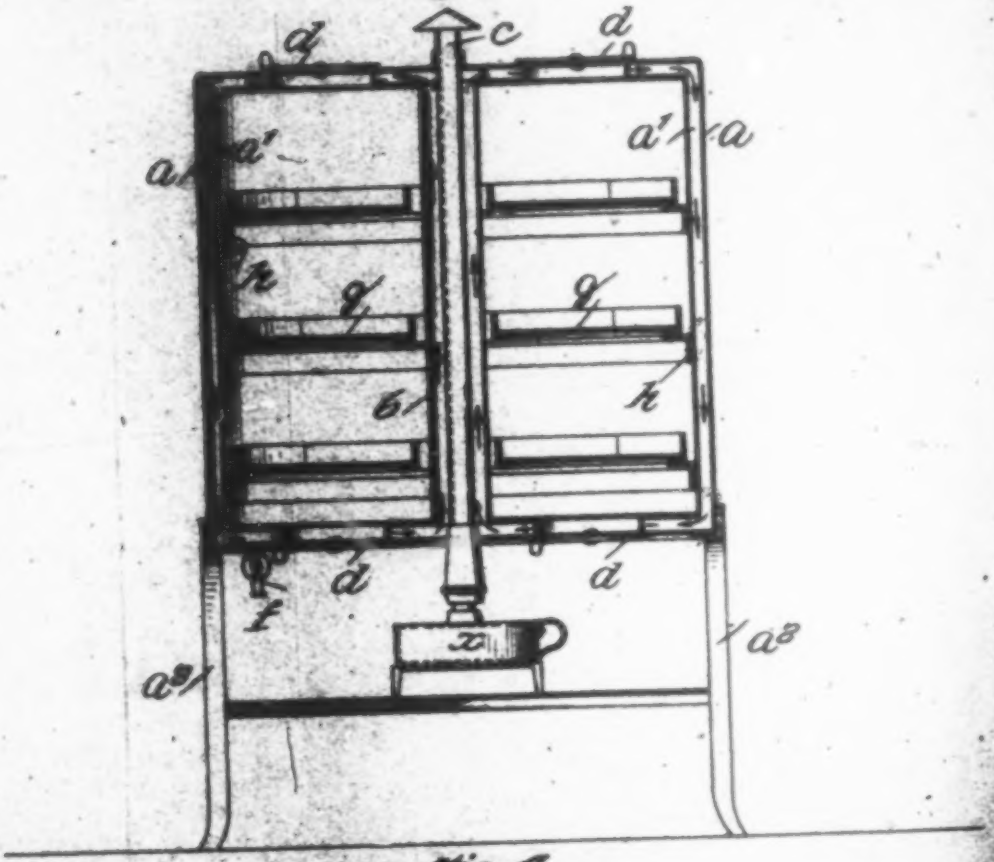
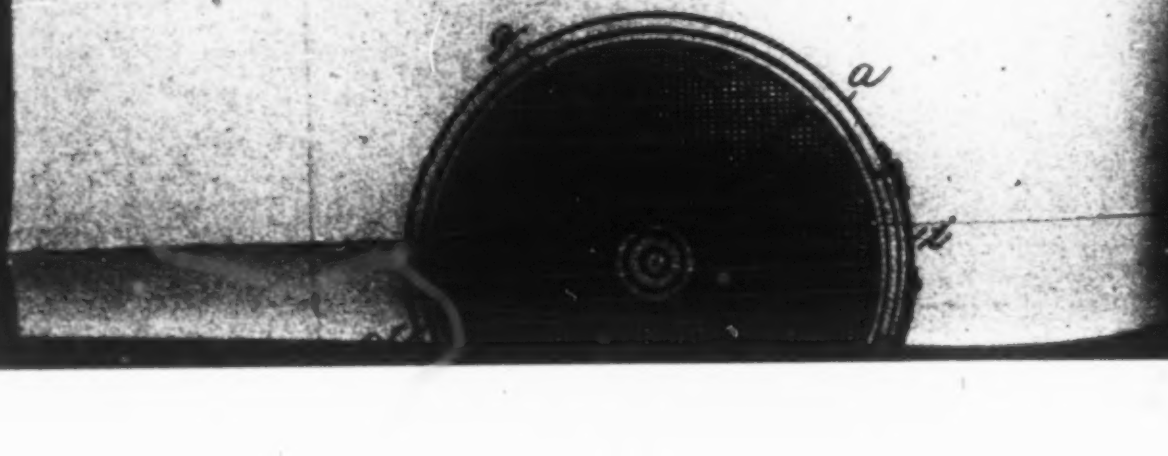


Fig. 4.



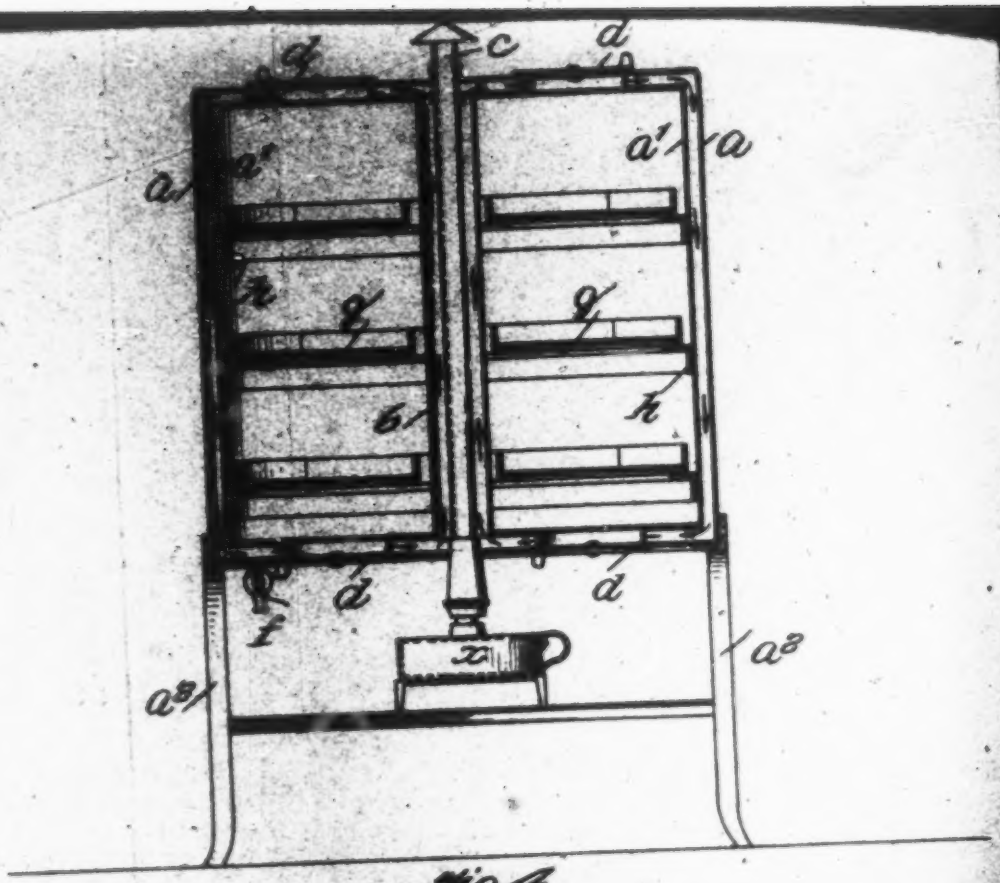
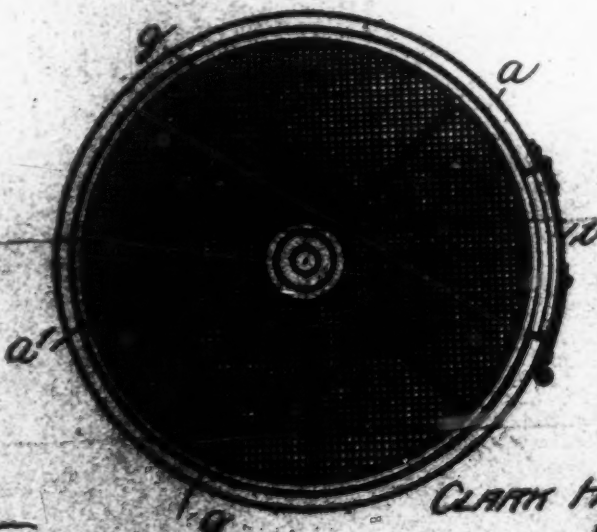


Fig. 4.



WITNESSES
H. C. Beck

INVENTOR
CLAUDE H. OSBORN
BY
ATTORNEY

UNITED STATES PATENT OFFICE.

CLARK H. OSBORN, OF ST. JOSEPH, MISSOURI.

INCUBATOR.

1,144,282. Specification of Letters Patent. Patented June 22, 1915.

Application filed July 14, 1914. Serial No. 851,488.

To all whom it may concern:

Be it known that I, CLARK H. OSBORN, a citizen of the United States, and a resident of St. Joseph, in the county of Buchanan and State of Missouri, have made an Improvement in Incubators, of which the following is a specification.

My invention pertains to that type of incubators in which the required temperature is maintained by heated water contained and circulating in the hollow walls surrounding the egg-holding pans or trays.

In carrying out my invention I support a series of pans or trays one over the other around a central vertical, metal tube which serves as an elongated chimney for a lamp employed as a heating medium. The egg trays are supported upon flanges secured to the inner wall of the body or casing of the incubator, and may be rotated thereon to facilitate the introduction of eggs through a door provided for this casing or body.

The details of construction, arrangement and operation of the incubator are as hereinafter described and shown in the accompanying drawings, in which:

Figure 1 is a side elevation of the incubator, [illegible] view. Fig. 3 is a cross-section of the same. Fig. 4 is a [illegible]

into the spaces in which it circulates as shown by arrows, Fig. 3. A drain-cock *f* is provided at the bottom of the body for drawing off water when required. Circular egg-holding pans *g* are provided, there being in this instance three arranged one above another, as shown in Fig. 3. The bottoms of these trays are formed of woven wire to permit free circulation of heated air. The pans are supported upon right-angular flanges *h* secured to the inner wall of cylinder *a*. The central portions of the trays are provided with flanged openings which receive the tube *c*, and permit the circulation of air. The outer body of the incubator is provided with a door *i*, the same being hinged and provided with a pivoted latch as shown.

It will be understood that the annular trays *g* may be rotated around the central tube *c* for the purpose of bringing any portion of them adjacent to the door for receiving eggs or removing egg-shells and chickens. The trays are each divided by four radial partitions *j*, as shown in Fig. 4. It will be understood that the water becoming heated from the lamp, will rise in the central space between the tubes *c*, *c*, and, by diverging at the top, they pass down around the tube and under the bottom of the [illegible] and then back to the

Application filed July 15, 1914. Serial No. 851,000.

To whom it may concern:

Be it known that I, CLARK H. OSBORN, a citizen of the United States, and a resident of St. Joseph, in the county of Buchanan and State of Missouri, have made an Improvement in Incubators, of which the following is a specification.

My invention pertains to that type of incubators in which the required temperature is maintained by heated water contained and circulating in the hollow walls surrounding the egg-holding pans or trays.

In carrying out my invention I support a series of pans or trays one over the other around a central vertical, metal tube which serves as an elongated chimney for a lamp employed as a heating medium. The egg trays are supported upon flanges secured to the inner wall of the body or casing of the incubator, and may be rotated thereon to facilitate the introduction of eggs through a door provided for this casing or body.

The details of construction, arrangement and operation of the incubator are as hereinafter described and shown in the accompanying drawing, in which,

Figure 1 is a side elevation of the incubator; Fig. 2 is a plan view: Fig. 3 is a central, vertical section of the same: Fig. 4 is a horizontal section.

The body of the incubator is cylindrical in form and constructed of sheet metal, there being two cylinders *a* and *a'*, the latter arranged within the former and spaced therefrom, top, bottom, and sides, to form a [illegible] which water circulates. The [illegible] two cylinders which thus form [illegible] supported by a tube *b* whose ends [illegible] with the top and bottom of [illegible] cylinder *a'*, as shown in Fig. 3. [illegible] is arranged within the tube [illegible] spaced therefrom by an annular [illegible] upper end of the inner tube *c* [illegible] the incubator body and is [illegible] with a cap. The lower end of the [illegible] tube *c* is [illegible] to adapt it to receive [illegible] a lamp, by which it is [illegible] The incubator [illegible] top and bottom with [illegible] layers of asbestos [illegible] heat. [illegible] [illegible] [illegible]

is apparent that the incubator may be continuously operated, fresh eggs being supplied as others are hatched.

I claim:—

1. The improved incubator comprising a body having hollow walls formed by inner and outer cylinders spaced apart, a central vertical tube connecting the upper and lower ends of the inner cylinder, a water-holding circulating space being thus formed at the top, bottom, sides, and middle of the incubator, and egg-holding trays arranged and supported within the inner cylinder, as described.

2. The improved incubator comprising a body former of inner and outer concentric cylinders spaced apart at top, bottom, and sides, a central tube connecting the top and bottom of the inner cylinder, and a smaller tube arranged within the former and spaced therefrom, the same being extended [illegible] the body and to the top of the outer [illegible] der and serving as a chimney and ha[illegible] tributer, as described.

3. The improved incubator comp[illegible] inner and outer concentric cylinders [illegible] apart at top, bottom and sides, a c[illegible] tube connecting the ends of the inner [illegible] der and providing a water circulating [illegible] in the center, and on the top, bottom, [illegible] sides of the body, a heating tube arra[illegible] within the first-named tube and sp[illegible] therefrom, and means attached to the [illegible] and bottom of the body for regulating [illegible] mission of air, as described.

CLARK H. OSBORN

Witnesses:
MOSES H. CRAIG,
ERNEST R. JAMES.

997

R. F. FULLINGTON.

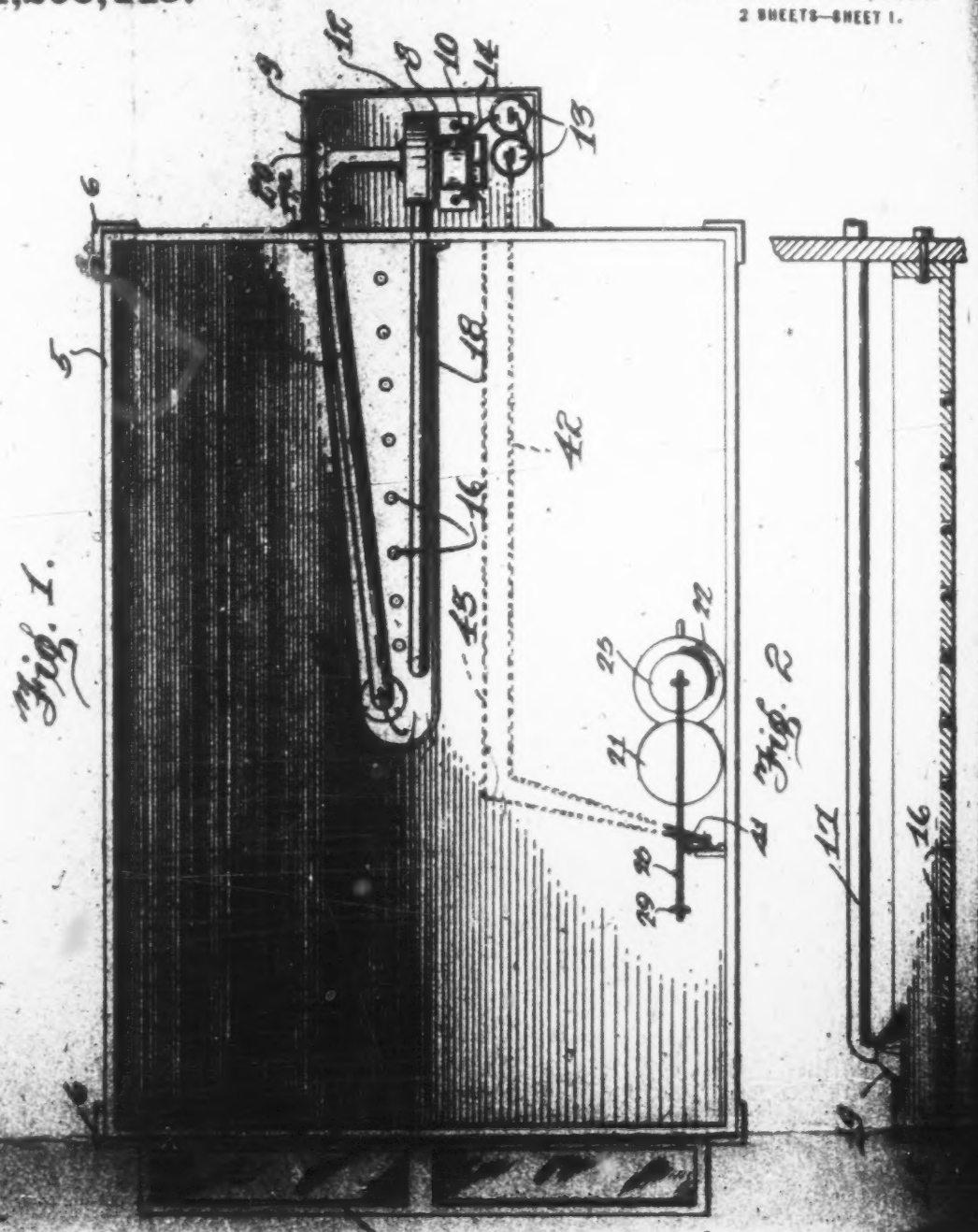
INCUBATOR ATTACHMENT.

APPLICATION FILED SEPT. 18, 1914.

1,205,445.

Patented Nov. 21, 1916.

2 SHEETS—SHEET 1.



2 SHEETS—SHEET 1.

Witnesses
Robert J. Woodward

Roy F. Fulling
by Richard Stevens

998

R. F. FULLINGTON.
INCUBATOR ATTACHMENT.
APPLICATION FILED SEPT. 18, 1914.

1,205,445.

Patented Nov. 21, 191
2 SHEETS—SHEET 2.

Fig. 3.

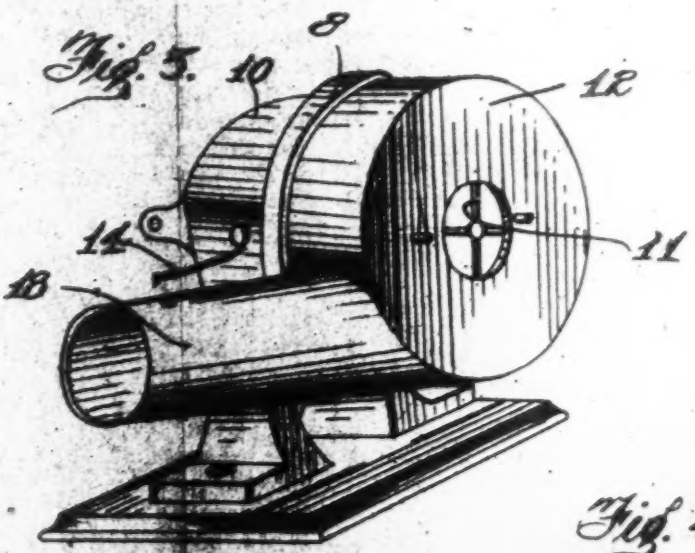


Fig. 4.

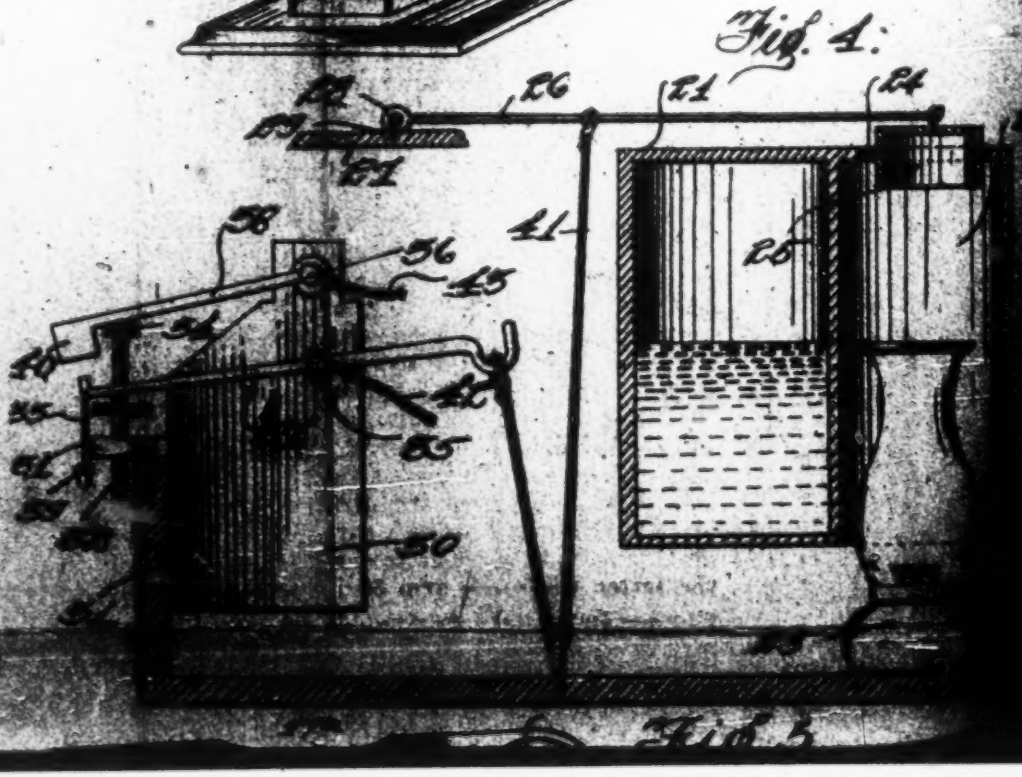


Fig. 5.

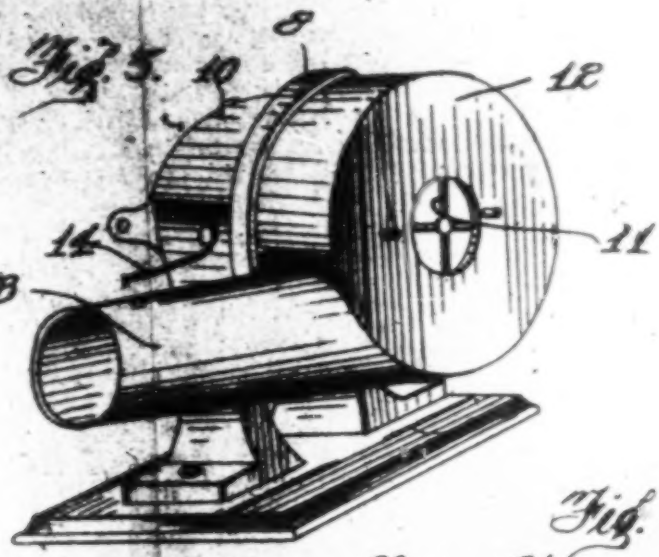


Fig. 4.

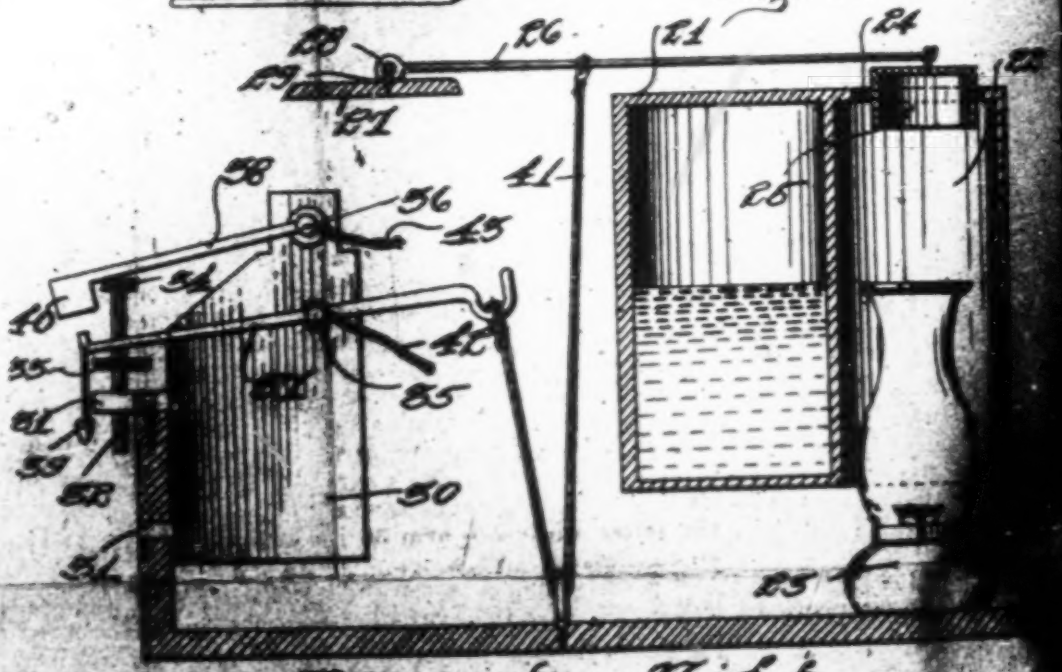
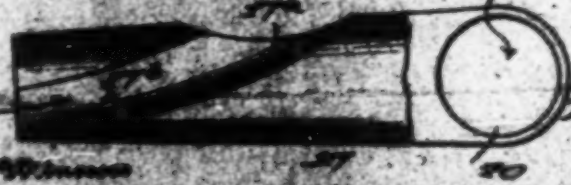


Fig. 3.



Witness
R. K. Morel
Thos. J. Woodward

Inventor
Roy T. Fullington
By Richard Owen
Attorney

UNITED STATES PATENT OFFICE.

ROY F. FULLINGTON, OF CLIFTON HILL, MISSOURI.

INCUBATOR ATTACHMENT.

1,205,445. Specification of Letters Patent. Patented Nov. 21, 1916.

Application filed September 18, 1914. Serial No. 862,376.

To all whom it may concern:

Be it known that I, ROY F. FULLINGTON, citizen of the United States, residing at Clifton Hill, in the county of Randolph and State of Missouri, have invented certain new and useful Improvements in Incubator Attachments, of which the following is a specification.

This invention relates to incubators or brooders, and has particular reference to an attachment for that type of devices which may be depended upon to automatically regulate the temperature at which the brooder or incubator is to be kept.

More specifically, it is an object of this invention to provide means normally quiescent for removing heated air from the interior of the incubator when actuated automatically by means governed by the increase of heat, so that overheating of the incubator is prevented.

A further object is to adapt the means previously set forth to prevent the under cooling of the incubator and to further provide means so simple in their construction and so capable of being cheaply manufactured that costly thermometers or thermostats may be dispensed with and yet their necessary operations performed in an equally efficient manner.

The above and additional objects which will become apparent as this explanatory description proceeds, are accomplished by such means as are illustrated in the accompanying drawings, described in the following specification, and then more particularly pointed out in the claims which are appended hereto and form a part [illegible]

[illegible] there [illegible] means [illegible]

meral 5 denotes the inclosing body portion of an incubator or brooder which may be supported in any usual manner as indicated at 6 and which is provided with a hinged closure 7, here illustrated as in its outwardly swung position. The interior of the casing 5 is adapted to be filled with rows or tiers of egg trays, which may be of the usual construction positioned in the customary manner. It is purposed by this invention to provide an electric fan 8 which shall be intermittently actuated as the amount of heat entering into the incubator shall dictate in order to maintain a proper temperature within the incubator. The electric fan is positioned in an auxiliary casing 9 and includes a small motor 10 to the central shaft of which is attached a fan 11 surrounded by a fan casing 12. Suitable sources of a difference of potential such as 13 are provided to furnish the motive power to the motor 10 being connected directly thereto in one instance by the wire 14 and indirectly in the other instance as shall be hereinafter more fully described.

Secured to the inner wall of the incubator 5 immediately adjacent one end of the outer casing 9 is a longitudinally extending air pan 15 which is apertured along its bottom as at 16 for communication with the interior of the incubator.

A pair of air circulating pipes 17 and 18 are longitudinally positioned within the pan 15 and pass [illegible] therefrom through the wall [illegible]

To all whom it may concern:

Be it known that I, ROY F. FULLINGTON, citizen of the United States, residing at Clifton Hill, in the county of Randolph and State of Missouri, have invented certain new and useful Improvements in Incubator Attachments, of which the following is a specification.

This invention relates to incubators or brooders, and has particular reference to an attachment for that type of devices which may be depended upon to automatically regulate the temperature at which the brooder or incubator is to be kept.

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The above and additional objects which will become apparent as this explanatory description proceeds, are accomplished by such means as are illustrated in the accompanying drawings, described in the following specification, and then more particularly pointed out in the claims which are appended hereto and form a part of this application.

With reference to the drawings, wherein there is illustrated the preferred embodiment of this invention as it is reduced to practice, and throughout the several views of which like characters of reference designate similar parts: Figure 1 is a plan view of an incubator with the cover and the egg trays removed, showing the various attachments comprehended by this invention as properly positioned. Fig. 2 is a sectional view through the air supply and removing means. Fig. 3 is a perspective view of the fan casing, and Fig. 4 is a view showing in detail the operation of the thermostat replacing means, or the automatic regulator. Fig. 5 is a detail sectional view on the line 5—5 of Fig. 1.

With reference to the drawings the numeral 5 denotes the inclosing body portion of an incubator or brooder which may be supported in any usual manner as indicated at 6 and which is provided with a hinged closure 7, here illustrated as in its outwardly swung position. The interior of the casing 5 is adapted to be filled with rows or tiers of egg trays, which may be of the usual construction positioned in the customary manner. It is purposed by this invention to provide an electric fan 8 which shall be intermittently actuated as the amount of heat entering into the incubator shall dictate in order to maintain a proper temperature within the incubator. The electric fan is positioned in an auxiliary casing 9 and includes a small motor 10 to the central shaft of which is attached a fan 11 surrounded by a fan casing 12. Suitable sources of a difference of potential such as 13 are provided to furnish the motive power to the motor 10 being connected directly thereto in one instance by the wire 14 and indirectly in the other instance as shall be hereinafter more fully described.

Secured to the inner wall of the incubator 5 immediately adjacent one end of the outer casing 9 is a longitudinally extending air pan 15 which is apertured along its bottom as at 16 for communication with the interior of the incubator.

A pair of air circulating pipes 17 and 18 are longitudinally positioned within the pan 15 and pass outwardly therefrom through the wall 5 of the incubator at a convenient point to enter the fan chamber 9. Through one of these pipes 17 warm foul air passes from the incubator and escapes through an opening 17^a in the pipe 17 into the fan chamber 9 or by a branch pipe outside the machine. An inclined partition 17^b is placed in the pipe 17 and divides the same just behind the opening 17^a so as to direct the path of air to the opening. The pipe 17 for convenience is continued rearwardly a short distance and then turned to connect with the eye of the fan 11. A branch pipe 20 extends from the turn of the pipe 17 and passes through the wall of the fan chamber 9, opens into the air without and thus provides means whereby fresh air enters the fan when the latter is running, said air being forced through the pipe 18 into the incubator. A conduit pipe 19 depends from the inner end of the pipe 17 directly above the tray 15 for the purpose of forming a broad

opening or inlet by which air may be directed into the pipe.

The automatic regulating means whereby the operation of a fan may be controlled to maintain a practically constant temperature in the incubator is illustrated more particularly in Fig. 4. In this figure, the numeral 21 designates a heater formed of a number of heating chambers, one of which 22 is adapted to contain the heating element 23 which as here shown may be a lamp, although it is obvious that any other means such as gas or electricity could be employed with equal facility for this purpose. The heating chamber 22 is apertured as at 24 in order to permit the damper 25 to be loosely dependent therein, such damper being carried at the end of a movable rod 26 which is secured to a support 27 which may be one of the egg trays if so desired in any suitable pivotal manner, although a specific description of a simple and novel means will be here afforded. The rod 26 may be formed with an eye 28 at its supported end, the said eye being embraced by a staple or other fastening means 29 so that the eye is maintained in a vertical plane and free to rotate slightly therein upon the obvious rounded portion, although frictionally resisting such rotation sufficiently to normally support the light damper 25 in a manner very sensitive to varying degrees of surrounding pressure.

A support 30 provided with securing extensions 31 is suitably mounted in the interior of the incubator in the most convenient position where it will be readily accessible and yet not occupy space desired for other purposes. One of the extensions 31 is provided with a threaded aperture to receive the stem 32 of an adjusting means 33, the upper end of which bears a rubber washer 34 or other suitable insulation. At 35 and 36 respectively there are pivoted a pair of arms 37 and 38 the former carrying a weight 39 at one end, in order to normally depress the latter while the arm 37 is formed with an enlarged contact member 40 and is adapted to engage the latter when the damper 25 is lifted by the heated air, whereby a circuit is completed upon the contacting of the levers 37 and 38.

An increase of heat generated by the element 23 might very easily prove detrimental to the contents of the incubator, yet before such heat could do harm in the presence of this invention the damper 25 would necessarily be buoyed up causing a contact between the pivoted arms and a completion of the circuit through the fan, which would then be actuated to force cool air into the casing through pipe 18 and drive out the foul air through the pipe 17. On the other hand should the temperature of the incubator become too low, it will be seen that the cause for this will be the failure of the heat generated by the lamp 23 from exerting an buoyant effect upon the damper 25, which as explained will cause a slackening in the connections 41, so that the connection will be broken between the pivoted arms and the heat again free to raise the temperature of the incubator without being disturbed or lessened by the rotation of the fan. It will thus be seen that efficient means have been provided capable of replacing the usual costly thermostat while at the same time forming a reliable automatic regulator for the heating of an incubator or brooder thereby attaining the previously presented objects.

While in the foregoing however, there has thus been illustrated in the drawings and described in the specification, such combination and arrangement of elements as constitute the preferred embodiment of this invention, it is desired to emphasize the fact that such minor changes in the matters of form, portion and degree may be made in the adaptations of this device as shall be within the spirit of the invention as defined by the appended claims.

What is claimed is:

1. An incubator attachment including an exhaust pipe for the air of said incubator, an inlet pipe therefor, a fan for circulating air through both of said pipes, a heating element for said incubator, means [illegible] the amount of heat generated by [illegible] amount of heat [illegible]

22 is adapted to contain the heating element 23 which as here shown may be a lamp, although it is obvious that any other means such as gas or electricity could be employed with equal facility for this purpose. The heating chamber 22 is apertured as at 24 in order to permit the damper 25 to be loosely dependent therein, such damper being carried at the end of a movable rod 26 which is secured to a support 27 which may be one of the egg trays if so desired in any suitable pivotal manner, although a specific description of a simple and novel means will be here afforded. The rod 26 may be formed with an eye 28 at its supported end, the said eye being embraced by a staple or other fastening means 29 so that the eye is maintained in a vertical plane and free to rotate slightly therein upon the obvious rounded portion, although frictionally resisting such rotation sufficiently to normally support the light damper 25 in a manner very sensitive to varying degrees of surrounding pressure.

A support 30 provided with securing extensions 31 is suitably mounted in the interior of the incubator in the most convenient position where it will be readily accessible and yet not occupy space desired for other purposes. One of the extensions 31 is provided with a threaded aperture to receive the stem 32 of an adjusting means 33, the upper end of which bears a rubber washer 34 or other suitable insulation. At 35 and 36 respectively there are pivoted a pair of arms 37 and 38 the former carrying a weight 39 at one end, in order to normally depress the latter while the arm 38 is formed with an enlarged contact portion 40 and is adapted to be adjustably supported by the screw 33. Flexible connections 41 are suitably interposed between the damper arm 26 and the free extremity of the weighted arm 37, so that depression of the damper arm will loosen or cause a slack in the connection 41 to permit the weight 39 to remove the weighted end of the arm 37 from the vicinity of the enlarged contact 40 while conversely elevation of the damper 25 would immediately insure a contact between the adjacent extremities of the arms 37 and 38. Suitable leads 42 connect the source of difference of potential 13 directly with the arm 37 while a similar wire 43 operatively connects the arm 38 with the remaining point of contact on the electric fan 8 so that a circuit through the fan, which ... then be actuated to force cool air into t... casing through pipe 18 and drive out t... foul air through the pipe 17. On the oth... hand should the temperature of the incub... tor become too low, it will be seen that t... cause for this will be the failure of the he... generated by the lamp 23 from exerting a... buoyant effect upon the damper 25, which ... explained will cause a slackening in the co... nections 41, so that the connection will b... broken between the pivoted arms and th... heat again free to raise the temperature o... the incubator without being disturbed a... lessened by the rotation of the fan. It wi... thus be seen that efficient means have be... provided capable of replacing the u... costly thermostat while at the same ti... forming a reliable automatic regulator f... the heating of an incubator or brooder th... by attaining the previously presented ob...

While in the foregoing however, there h... thus been illustrated in the drawings a... described in the specification, such com... tion and arrangement of elements as co... tute the preferred embodiment of this in... tion, it is desired to emphasize the fact ... such minor changes in the matters of ... portion and degree may be made in ... adaptations of this device as shall not ... the spirit of the invention as defined i... appended claims.

What is claimed is:

1. An incubator attachment includ... exhaust pipe for the air of said in... an inlet pipe therefor, a fan for cir... air through both of said pipes, a h... ment for said incubator, means s... the amount of heat generated by ... ment, adjustable means for con... automatic operation of said se... in regulating the amount of heat ... and means connected with said ... means and interconnected with ... cause actuation of the latter u... crease of heat beyond said ma...

2. In combination, with a he... a damper mounted in the path o... gases generated by said el... ed to be actuated by the flow of ... gases, a pair of pivoted arms, m... justing one of said arms, mean... the other of said arms and te... vent contact of the two, connecti... said damper and said second a... a contact of said arms upon ...

damper, an air pan apertured longitudinally, an outlet pipe spaced from said air pan to draw heated air therefrom, an inlet pipe positioned in said pan to convey a cooler air, and fan means for circulating air through said inlet and outlet pipes in a circuit set in motion by the contact between said arms caused by said damper.

3. The combination with an apertured tray of a pipe serving as an air outlet from said tray, an air inlet for said tray, a fan for circulating air through both of said pipes simultaneously to cool the tray, a heating element, a damper sensitively pivoted in the path of the heated gases from said element for actuation by the flow thereof, a support, arms separately pivoted to said support, adjustable means supporting one of said arms weight means carried by the other of said arms to prevent a contact between the arms, a flexible connection between said weight arm and the sensitive mounting for said damper to cause a contact between the arms upon movement of the damper in one direction and permitting said weight means to break the contact of said arms in the other direction and a circuit closed by contact between said arms for the operation of said fan.

In testimony whereof I affix my signature in presence of two witnesses.

ROY F. FULLINGTON.

Witnesses:
TOM BOWEN,
MARY SEARS.

Date of Application, 23rd July, 1887
Complete Left, 23rd Apr., 1888
Complete Accepted, 26th May, 1888

A.D. 1887, 23rd JULY. N° 10,288.

PROVISIONAL SPECIFICATION.

Improvements in and relating to Incubators.

I, JOHN GARDNER, of Hadfield, in the County of Derby, dealer in Type-writing machines do hereby declare the nature of this invention to be as follows:—

This invention relates to incubators, and has for its objects to secure continuous operation and greater certainty in the results.

As incubators are at present constructed and employed, the full charge of eggs is placed in the apparatus at once and the whole of the chickens hatched therefrom have therefore to be handled and dealt with simultaneously and as they are all of about the same age, many of them will require to be fed longer than is necessary.

My improvements consist in so constructing and operating the Incubator and its accessories that chickens may be hatched and withdrawn therefrom daily or at any less frequent intervals as may be required.

The Incubator constructed according to these Improvements consists of a series of compartments or chambers within which are fitted drawers for containing the eggs. Care is taken in construction that all the drawers are interchangeable. I have found by experiment that the external or artificial heat required for hatching gradually diminishes from the first day, the total difference being about three degrees. I therefore arrange that each chamber or compartment shall be continuously maintained at the same temperature and that succeeding or different chambers shall have different [illegible] temperatures so that the drawers containing the eggs may be periodically removed from the higher temperature chambers to the lower until they have passed through the whole series of chambers and are finally hatched in the chamber [illegible] lowest temperature. Thus, without limiting myself to any particular [illegible] of chambers, the first chamber may have a constant temperature of 105 deg. F.; the second 103.5 deg.; the third 104 deg.; the fourth 103.5 deg.; the fifth 103 deg.; the sixth 102.5 deg.; and the seventh and last 102 deg. In such an arrangement [illegible] would be hatched continuously, and fresh eggs may be placed in the [illegible] of the apparatus daily, for which purpose it will be convenient to [illegible] three or a multiple of three drawers in each chamber so that each day's [illegible] may be separately transferred to the following chambers.

[illegible]

Gardner's Improvements in and relating to Incubators.

Each of the chambers or compartments communicates with a flue which is connected to an exhaust fan, an aspirator or other means for withdrawing air. The openings from the chambers or compartments are opened or closed by a valve the movement of which is controlled by any suitable thermostat, but preferably is constructed as follows: the ends of a curved strip or bar of metal or of a compound bar or strip of metal or metals are firmly secured to a suitable base. To about the centre of the curved bar one end of a light rod is adjustably secured and the other end of the rod is connected or geared to the spindle of the valve. In the event of a slight variation of the temperature the bar tends to increase or diminish in length, its ends being rigidly fixed, this tendency results in an increase or diminution in its curvature, and by the motion so set up the position of the valve is controlled. The exact temperature required is secured by the amount of air passing through the compartment, and this is governed by regulating the adjustable connection of the rod with the curved bar. This having been regulated once, will require no further regulation for a long period.

The heat supply of the whole apparatus may be derived from any source ordinarily employed and controlled by any usual means or by the hereinbefore described thermostat which may be employed to operate a valve or to control the gas supply when gaseous fuel is used.

Dated this 22nd day of July A.D. 1887.

WILLIAM E. HEYS,
Agent for the Applicant.

COMPLETE SPECIFICATION.

Improvements in and relating to Incubators.

I, JOHN GARDNER, of Hadfield, in the County of Derby, dealer in type-writing machines do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to Incubators and has for its objects to secure continuous operation and greater certainty in the results.

As incubators are at present constructed and employed the full charge of eggs is placed in the apparatus at once and the whole of the chickens hatched therefrom have therefore to be handled and dealt with simultaneously, and as they are all of about the same age, many of them will require to be fed longer than is necessary.

My Improvements consist in so arranging and operating the incubator and its accessories that chickens may be hatched and withdrawn therefrom daily or at any other convenient intervals as may be desired.

The incubator constructed according to these improvements consists of a series of compartments or chambers, within which are fitted drawers for containing the eggs. Care is taken in construction that all the drawers are interchangeable. I have found by experiment that the external or artificial heat required for hatching gradually diminishes from the first day, the total difference being about 3 deg. I therefore arrange that each chamber or compartment shall be continuously maintained at the same temperature and that succeeding or different chambers shall have different successive temperatures, so that the drawers containing the eggs may be periodically transferred from the high temperature chambers to the lower, until they have passed through the whole series of chambers and are finally hatched in the chamber having the lowest temperature. Thus, without limiting myself to any particular mode of construction or number of chambers, the first chamber may have a constant temperature of 105 deg. F.; the second 104.5 deg. the third 104 deg.; the fourth 103.5 deg.; the fifth 103 deg.; the sixth 102.5 deg.; and the seventh and last 102 deg. F. In such an arrangement the chickens would be hatched continuously, and fresh eggs may be placed in the first compartment of the apparatus daily, for which purpose it will be convenient to arrange for three or a multiple of three drawers in each chamber so that each day's eggs may be kept separate and be separately transferred to the following chamber on following days.

Each of the chambers or compartments communicates with a flue which is connected to an exhaust fan, an aspirator or other means for withdrawing air. The openings or exit from the chambers or compartments may be opened or closed by a valve, the movement of which is controlled by any suitable thermostat but preferably by a thermometer constructed as follows:—the ends of a curved strip or bar of metal or of a composite bar or strip of metals or metal are firmly secured to a suitable base. To about the centre of the curved bar, one end of a light rod is attached, and the other end of the rod is connected or geared to the air

of the valve. In the event of a slight variation in the temperature the bar tends to increase or diminish in length, but its ends being rigidly fixed, this tendency results in an increase or diminution in its curvature and by the motion so set up, the position of the valve is controlled. The exact temperature required is secured by the amount of air passing through the compartment and this is governed by regulating the adjustable connection of the rod with the curved bar. This having been regulated once, will require no further regulation for a long period.

The heat supply of the whole apparatus may be derived from any source ordinarily employed and controlled by any usual means or by the hereinbefore described thermostat which is of known construction and may be employed to operate a valve or to control the gas supply when gaseous fuel is used.

I desire it to be understood that I do not claim as constituting any part of this my said Invention, any particular type or construction of an incubator or of apparatus for regulating heat therein, since these are generally well known; and that I limit myself to the arrangement and operation of a series of incubating chambers or chambers containing incubators.

Having now particularly described and ascertained the nature of my said Invention and in what manner the same is to be performed, I declare that what I claim is:—

The Improvements in and relating to incubators substantially as hereinbefore described which consist in the arrangement and operation of a series of incubating chambers or chambers containing incubators heated by air set in motion by artificial means, each of the series after the first being kept at a slightly lower temperature than the preceding chamber and the eggs being periodically transferred through the series from the chamber having the highest to that having the lowest temperature.

Dated this 20th day of April A.D. 1888.

WILLIAM E. HEYS,
Agent for the Applicant.

LONDON: Printed for Her Majesty's Stationery Office,
By DARLING AND SON, LTD.
1888.

1007

KAISERLICHES PATENTAMT.

DEC. 6

VERÖFFENTLICHT DEN 14. NOVEMBER 1904.

PATENTSCHRIFT

— № 155917 —

KLASSE 45 h.

E. STULIK IN LICHTENBERG B. BERLIN.

Brutverfahren und Vorrichtung mit gruppenweiser Beschickung und gleichzeitiger Behandlung der zu verschiedenen Zeiten in den Brutapparat eingesetzten Eiergruppen.

Patentiert im Deutschen Reiche vom 7. November 1901 ab.

Bei den bisher bekannten Brutverfahren mit gruppenweiser Beschickung der verschiedenen Abteilungen des Brutapparates und gleichzeitiger Behandlung der zu verschiedenen Zeiten in die Brutvorrichtung eingesetzten Eiergruppen ist auf die Erhaltung einer gleichförmigen Temperatur im ganzen Brutraum zu wenig Rücksicht genommen. Bei den bekannten Verfahren dieser Art werden die einzelnen, zu verschiedenen Zeiten einzusetzenden Gruppen mit Bezug auf die Heizmittelführung parallel geschaltet. Entweder werden dabei die einzelnen Eierträger in einem von einem aufsteigenden Warmluftstrom durchzogenen Brutraum nacheinander in gewissen Zeitabschnitten seitlich verschoben, bis sie den ganzen Brutraum durchwandert haben, oder aber es wird eine Reihe zu verschiedenen Zeiten zu belegender Eierträger unter einem Warmwasserkessel angeordnet und während der Brutzeit jeder Eierträger für sich in passende Entfernung vom Heizkessel gebracht. Im ersten Fall wird der gegen Ende der Brütezeit wachsenden Eigenwärme der Eier nicht genügend Rechnung getragen, während im letzteren Fall, wo der oben im Brutraum angeordnete Warmwasserkessel den Brutraum durch Strahlung heizt, nach oben zu ein zu rascher Temperaturabfall eintritt, so daß nicht genügend viel Abteilungen für die Veränderung der Stellung der Eierträger während der Brütezeit vorgesehen sind. Demgegenüber werden gemäß der vorliegenden Erfindung die zu verschiedenen Zeiten in den Brutraum eingesetzten Eiergruppen immer unmittelbar ein und demselben Warmluftstrom ausgesetzt, und zwar derart, daß die Eiergruppen fortschreitend oder stufenweise in der Richtung des Warmluftstromes von der Wärmequelle entfernt werden, so daß die einzelnen Gruppen schließlich den ganzen Brutraum durchwandern. Hierdurch wird erreicht, daß die zuerst frisch in den Brutraum gebrachten Eiergruppen der vollen Wärme des Warmluftstroms ausgesetzt sind, während die älteren und im Brutraum weitergerückten Eiergruppen dem Warmluftstrom erst ausgesetzt werden, nachdem dieser bereits einen Teil seiner Wärme abgegeben hat. Es ist dadurch die Möglichkeit gegeben, daß unter Berücksichtigung der von den Eiern bei vorgeschrittenem Brüten entwickelten Eigenwärme in allen Abteilungen des Brutraumes eine gleichförmige Temperatur herrscht, indem in den über- oder nebeneinander liegenden Abteilungen die dem Warmluftstrom entzogene Wärme durch die Eigenwärme der Eier ergänzt wird. Es wird somit verhütet, daß die älteren Abteilungen einem zu hohen Wärmegrad ausgesetzt werden.

Die für das neue Brutverfahren eingerichteten Vorrichtungen bieten insbesondere für kleinere Betriebe den Vorteil, daß während des Ganges der Vorrichtung in bestimmten kleineren Zeiträumen frische Eiergruppen eingelegt werden können. Zweckmäßig befinden sich die verschiedenen Abteilungen übereinander, weil hierdurch einerseits eine günstige Verbindung der Vorrichtung mit dem als Glucke dienenden Raum und andererseits eine günstige Durchlüftung, also eine wirk-

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same Ableitung der aus den bebrüteten Eiern sich entwickelnden Gase ermöglicht wird.

Auf der Zeichnung ist die neue Brutvorrichtung veranschaulicht, und zwar zeigt Fig. 1 die Vorderansicht bei teilweisem Schnitt, Fig. 2 den Längenschnitt, Fig. 3 den Querschnitt nach *A-A* von Fig. 1, Fig. 4 den Querschnitt nach *B-B* von Fig. 2; Fig. 5 zeigt schematisch eine abgeänderte Ausführungsform.

Bei der Ausführung Fig. 1 bis 4 sind in dem Brutraum *a* die Kästen *b* übereinander angeordnet. Die erwärmte Brütluft tritt durch das Rohr *c* unter den untersten Brutkasten. Die Kästen *b* sind mit Durchlochungen versehen, welche der erwärmten Luft das Aufsteigen durch alle durch die Kästen *b* gebildeten Abteilungen gestattet. Die oberste Abteilung ist mit dem Luftabzug *d* versehen. Der Brutraum *a* besitzt auf der einen Seite die den Kästen *b* entsprechenden, übereinander angeordneten Türen *f* (Fig. 2). Die Brutkästen *b* können einzeln herausgenommen werden. Der Brutraum *a* ist zweckmäßig von einem Mantel *w* zur Aufnahme erwärmten Wassers umgeben, um Wärmeabgabe nach außen zu verhindern. Eine äußere Tür *g* vor den Türen *f* kann als Schutz gegen Wärmeausströmung durch die Türen *f* angeordnet sein, wie Fig. 2 zeigt. Die Einrichtungen zum Schutze gegen Wärmeabgabe nach außen gehören nicht unmittelbar zur vorliegenden Erfindung.

Bei der dargestellten Ausführung befindet sich der Brutraum *a* über dem bekannten, als Glucke dienenden Behälter *h*. Innerhalb dieses Behälters *h* liegt die Heizkammer *i*, die von irgend einer Wärmequelle, wie Pfeil *k* andeutet etwa durch eine bei *s* aufgestellte Lampe, mit heißer Luft beschickt wird. Ein nach außen führender Abzug für die Heizgase kann bei *l* vorgesehen sein.

Das Luftzuführrohr *c* ist durch die Kammer *i* hindurchgeführt. Die Heizgase strömen aus dem Raum *i* durch eine Öffnung *m* in die Kammer *y* und verteilen sich von hier in die Röhren *n*, die das Wasser im Mantel *w* erwärmen. Die Gase sammeln sich schließlich wieder im Raum *x*, um von hier aus bei *v* abzuziehen.

Beim Betrieb wird zunächst die unterste Brutabteilung beschickt und nach einiger Zeit der unterste Brutkasten mit den Eiern herausgenommen und in die nächst obere Abteilung gebracht. Die Eier könnten auch einfach in die nächst obere Abteilung herübergelegt werden. Dann folgt die erneute Beschickung der untersten Abteilung. Dieser Vorgang wiederholt sich, so daß allmählich die einzelnen Gruppen bis nach der oben Abteilung gelangen. Mit dem Luftabzug kann in bekannter Weise eine Vorrichtung verbunden sein, die abhängig von der Wärme in der obersten Brutabteilung die Beheizung mittels der Hebelübersetzung *p* regelt, indem sie die Verschlußklappe *q* für den Abzug der Heizkammer *i* mehr oder weniger öffnet oder schließt.

Die beschriebene Brutvorrichtung läßt sich in ihren Einzelheiten abändern. Wie Fig. 5 zeigt, können die Abteilungen 1 bis 7, welche nacheinander von dem Warmluftstrom und von den Eiern durchwandert werden, nebeneinander angeordnet sein. In jedem Falle ist es wesentlich, daß die von den Eiern mit der Zeit entwickelte Eigenwärme für die gleichmäßige Erhaltung der Temperatur im ganzen Brutraum berücksichtigt wird. Die Anordnung eines Heizmantels ist für das Verfahren nicht unbedingt erforderlich, derselbe verhindert aber Unregelmäßigkeiten durch Wärmestrahlung nach außen. Durch die beschriebene Vorrichtung wird vor allem vermieden, daß die Eier gegen Ende der Brütezeit einem zu hohen Wärmegrade ausgesetzt sind.

Patent-Ansprüche:

1. Brutverfahren mit gruppenweiser Beschickung und gleichzeitiger Weiterschaltung der zu verschiedenen Zeiten in den Brutapparat eingesetzten Eiergruppen, dadurch gekennzeichnet, daß die in den Brutraum zu verschiedenen Zeiten eingesetzten Eiergruppen demselben Warmluftstrom unmittelbar in der Weise ausgesetzt werden, daß die Eiergruppen gruppenweise in der Richtung des Warmluftstromes in größere Entfernung von der Wärmequelle gebracht werden, wobei zuerst die frisch in den Brutraum gebrachte Eiergruppe und dann nacheinander die älteren Gruppen bestrichen vom Warmluftstrom auf die einzelnen Eiergruppen so viel Wärme überträgt, daß unter Berücksichtigung der zu der Zeit verschiedenen Eigenwärmen der Eier im ganzen Brutraum eine gleichförmige Temperatur herrscht.

2. Brutvorrichtung zur Ausführung des Verfahrens nach Anspruch 1, dadurch gekennzeichnet, daß die zur gruppenweisen Weiterschaltung der Eier dienenden, der Brütluft freien Zutritt zu den Eiern gestattenden Eierträger, welche die von dem Warmluftstrom nacheinander durchwanderten Einzelabteilungen bilden, nebeneinander angeordnet sind.

Hierzu 1 Blatt Zeichnungen.

BERLIN, GEDRUCKT IN DER REICHSDRUCKEREI.

Fig. 1.

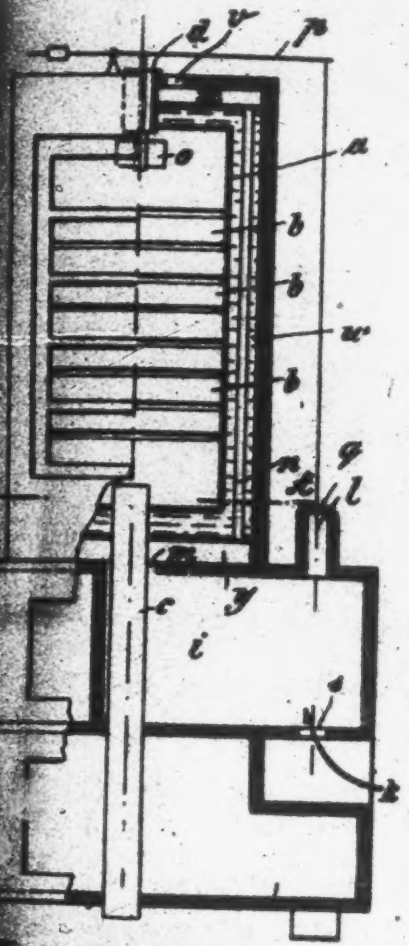


Fig. 2.

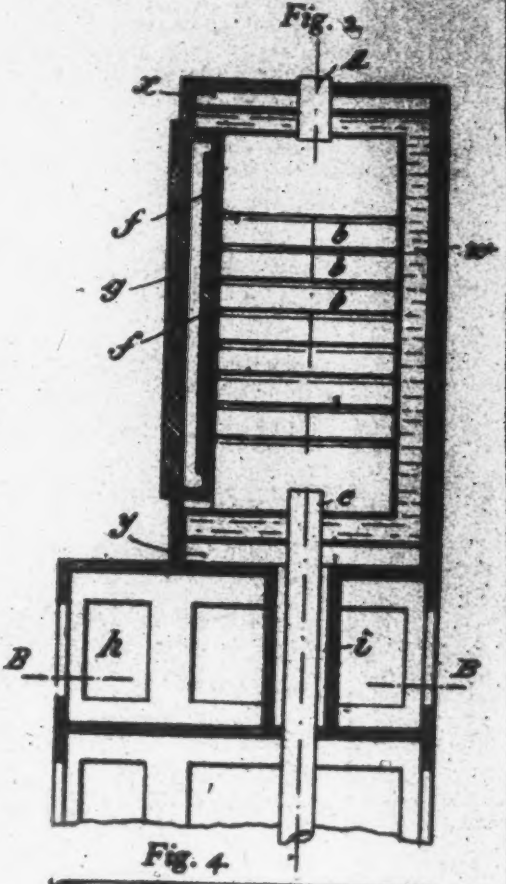


Fig. 3.

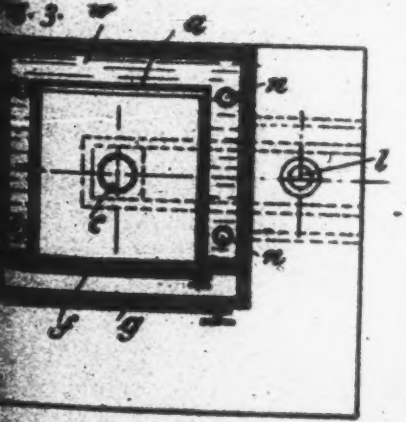


Fig. 4.

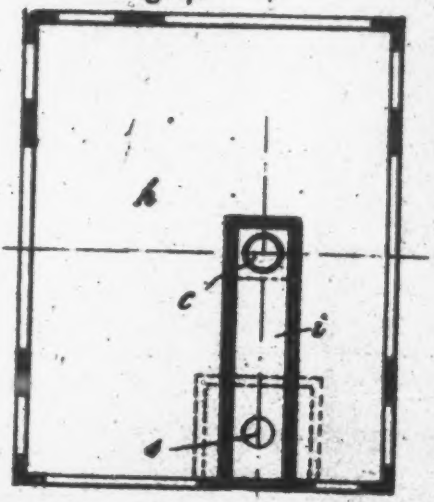


Fig. 5.

№ 155917.

[fol. 1299] DEFENDANTS' EXHIBIT No. 9

Translation German Patent

Translation

Translation from German
CVB ESF

German Patent Office

Letters Patent No. 155917

Class 45 h.

E. STULIK in LICHTENBERG NEAR BERLIN

Incubating Method and Appliance with Feeding in Batches and Simultaneous Treatment of the Batches of Eggs Placed at Different Times in the Incubator

Patented in Germany as from November 7th, 1901

In connection with the incubating (hatching) processes hitherto used in which the different compartments of the incubator were filled in batches and in which the batches of eggs placed in the incubator at different times were treated simultaneously, not sufficient attention has been given to the maintenance of a uniform temperature throughout the entire incubator space. In connection with the known processes of this kind, the individual batches to be inserted at different times are arranged in parallel with regard to heat emission. In this connection either the individual egg carriers, in a hatching space (incubating space) through which the air current passes upward from below are either [fol. 1300] shifted laterally one after the other at certain intervals until they have passed through the entire hatching space or a series of egg carriers in which the eggs are to be placed at different times are arranged below a hot water boiler and during the hatching time each egg carrier successively is placed at a suitable distance from the heating boiler. In the former case, not sufficient consideration is given to the natural heat of the eggs which increases towards the end of the hatching period while in the latter case,

which connection the hot water boiler arranged above the hatching space, heats the hatching space by radiation which connection there takes place in the downward direction a too rapid decrease in the temperature so that there are not sufficient stages provided for the changing of the position of the egg carriers during the hatching period.

On the other hand and in accordance with the invention under consideration, the batches of eggs entered into the hatching space at different times are always directly exposed to one and the same hot air current in such a manner that the batches of eggs are removed progressively or in stages in the direction of the hot air current from the source of heat so that the individual groups finally have passed through the entire hatching space. In this way it is made possible that the fresh batches first entered in the hatching space are exposed to the full heat of the hot air current while the older batches of eggs which have already been shifted ahead in the hatching space are only exposed to the hot air current after same has already given off a part of its heat. In this way it is made possible that [Vol. 1301] under due consideration of the natural heat developed by the eggs during the advanced stages of the hatching, a uniform temperature prevails in all compartments of the hatching space inasmuch as in the sections on top or alongside, the heat of which the warm air current is deprived, is replaced by the natural heat of the eggs. In this manner, it is prevented that the older batches are exposed to an excessively high degree of heat.

The devices or appliances arranged for the new hatching process, especially in the case of small plants, offer the advantage that during the operation of the apparatus, at certain intervals of time, fresh batches of eggs can be introduced. The different compartments are suitably arranged above each other for the reason that in this manner on the one hand a favorable connection of the devices with the compartment serving as brood hen while on the other hand there is made possible a favorable ventilation, i. e. an effective removal of the gases developing from the eggs to be hatched.

The illustration shows the new hatching device (incubator) viz. Figure 1 shows a front view with partial section; Figure 2 shows the [illegible] egittudinal section; Figure

shows the cross-section in the direction of A-A of Figure 1; Figure 4 shows the cross-section in the direction of B-B of Figure 2; Figure 5 shows a different manner of execution schematically.

In connection with the execution of Figure 1-4 the trays (b) are arranged on top of each other in the hatching space (a). The heated hatching air enters through the tube or conduit (c) under the lowest hatching tray. The trays (b) [fol. 1302] are provided with perforations which make it possible for the heated air to pass upwards through all the compartments formed by the trays (b). The uppermost compartment is provided with the air outlet (d). The hatching space (a) is provided, on the one side, with doors (f) (Figure 2), arranged on top of each other and corresponding to the trays (b). The hatching trays (b) can be removed individually. The hatching space (a) is surrounded suitable by a jacket (w) for the receiving of heated water in order to prevent any radiation of heat toward the outside. An outer door (g) in front of the door (f) may be arranged, as protection against heat radiation through the doors (f) as in Figure 2. The devices for the protection against heat radiation toward the outside are not a direct part of the invention under consideration.

In connection with the mode of construction, illustrated the hatching space (a) is located above the known container (h) serving as brood hen. Within this container (h) there is arranged the heating chamber (i) which is fed by means of any source of heat with hot air as indicated by arrow (k), for instance by a lamp located at s. The outlet leading toward the outside for the heating gases can be provided at I.

The air feed tube (c) is led through the chamber (i). The heating gases pass out of the space (i) through an opening (m) into the chamber (y) and thence are distributed in the tubes (n) which heat the water in the jacket (w). The gases collect finally again in space (x) whence they escape at v.

In operation, the eggs are first placed in the lowest hatching compartment and after some time the lowest hatching [fol. 1303] tray with the eggs is taken out and placed in the next highest compartment. The eggs can also simply be transferred into the next higher compartment. Thereupon

the eggs are again placed in the lowest compartment. This process is repeated so that slowly the individual batches reach the uppermost compartment. With the air outlet (d) there can be connected in the known manner a device (e) which regulates (this depending on the heat prevailing in the uppermost hatching compartment) the heating by means of the lever transmission (p) by opening or closing to a more or less considerable extent the shutting-off valve (q) for the outlet (l) of the heating chamber (i).

The hatching or incubating device described can be changed with regard to its individual parts. As shown in Figure 5, the compartments 1-7 through which the hot air current and the eggs pass consecutively may be arranged alongside of each other. In any event it is of material importance that the natural heat developed by the eggs in the course of the hatching, is taken into due consideration for the uniform maintenance of the temperature throughout the entire hatching space. The arrangement of a heating jacket is not absolutely necessary for the process. Same prevents, however, irregularities caused by radiation of heat toward the outside. By the device describd it is prevented above all that the eggs, at the end of the hatching period, are exposed to a too high degree of heat.

Patent Claims

(1) Hatching Process with entering of the eggs in batches and simultaneous treatment of the different [fol. 1304] batches of eggs introduced into the incubator at different times, characterised in that the batches of eggs introduced into the hatching space at different times are exposed directly to the same hot air current in the manner that the batches of eggs, in different stages are arranged in the direction of the hot air current at a gradually increasing distance from the source of heat, in which connection the hot air current passes first over the batch of eggs freshly introduced into the hatching space and consecutively the older batches of eggs imparting to the individual batches of eggs such an amount of heat as is required, taking into due consideration the natural heat of the eggs which differs at the various periods of time so that in the entire hatching space a uniform temperature prevails.

(2) Incubating or Hatching Device for the carrying out of the process in accordance with claim 1 characterized in that the egg trays serving for the moving of the batches of eggs and freely admitting the hatching air to the eggs and forming the individual compartments through which the hot air current passes consecutively are arranged alongside each other or above each other.

Hereto attached one sheet of drawings.

1017

C. C. PECK.

AUTOMATIC FAN SYSTEM OF HEATING.

APPLICATION FILED MAR. 3, 1909.

917,483.

Patented Apr. 6, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

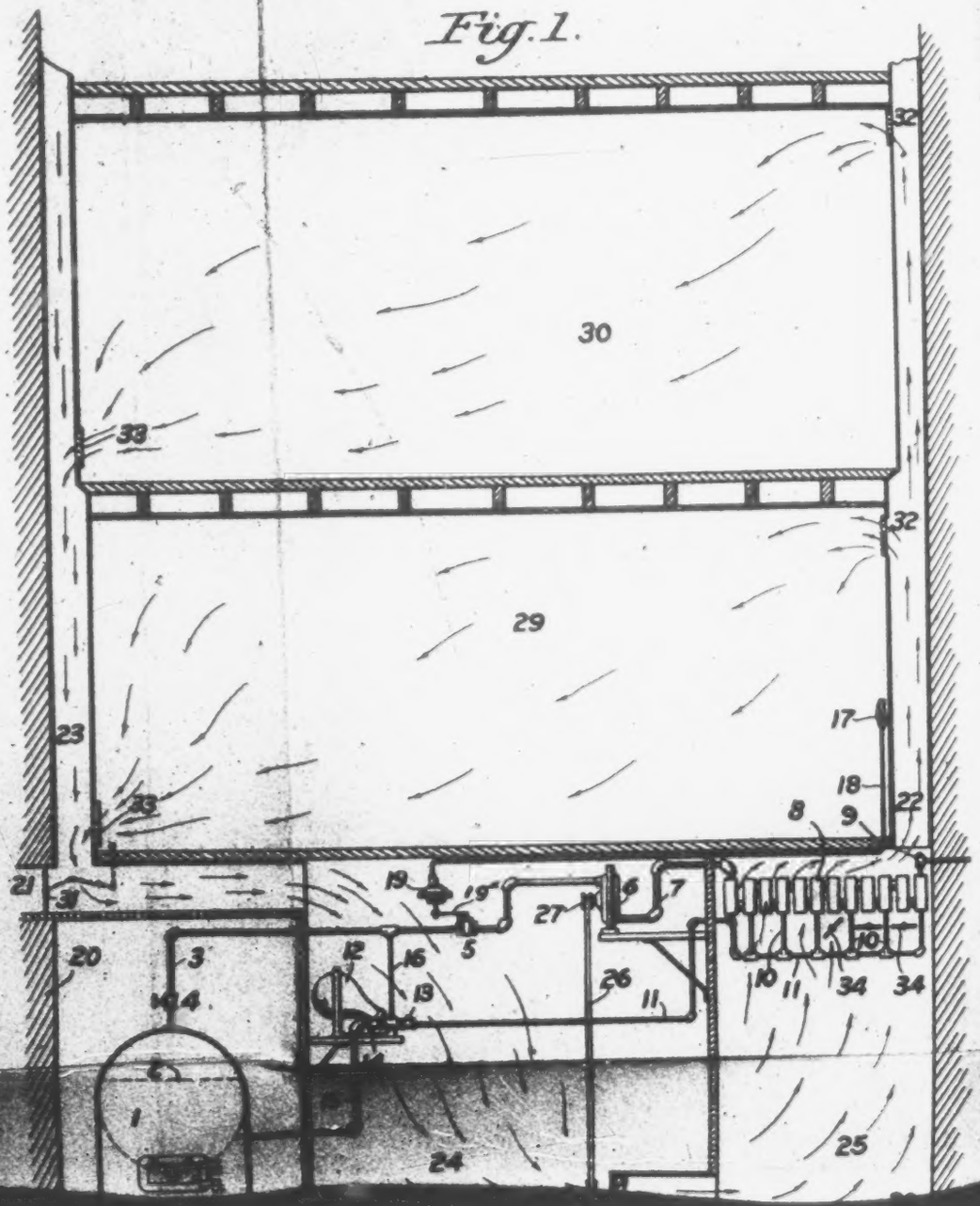
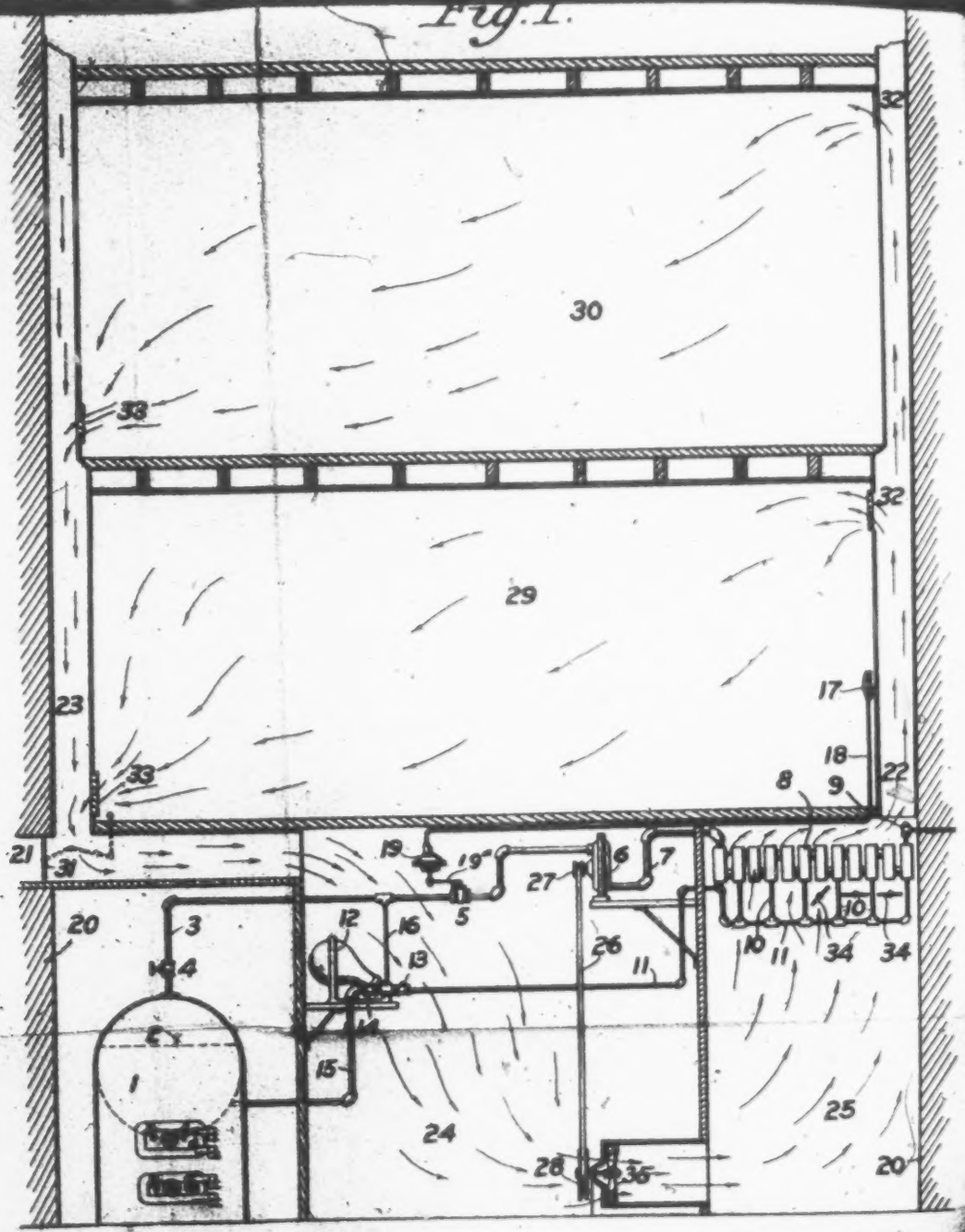


Fig. 1.



WITNESSES:
Charles L. Whitmore
Clarence W Carroll

INVENTOR:
Cassius Carroll Peck

1018

C. O. PECK.

AUTOMATIC FAN SYSTEM OF HEATING.

APPLICATION FILED MAR. 3, 1908.

917,483.

Patented Apr. 6, 1909.

2 SHEETS—SHEET 2.

FIG.2.

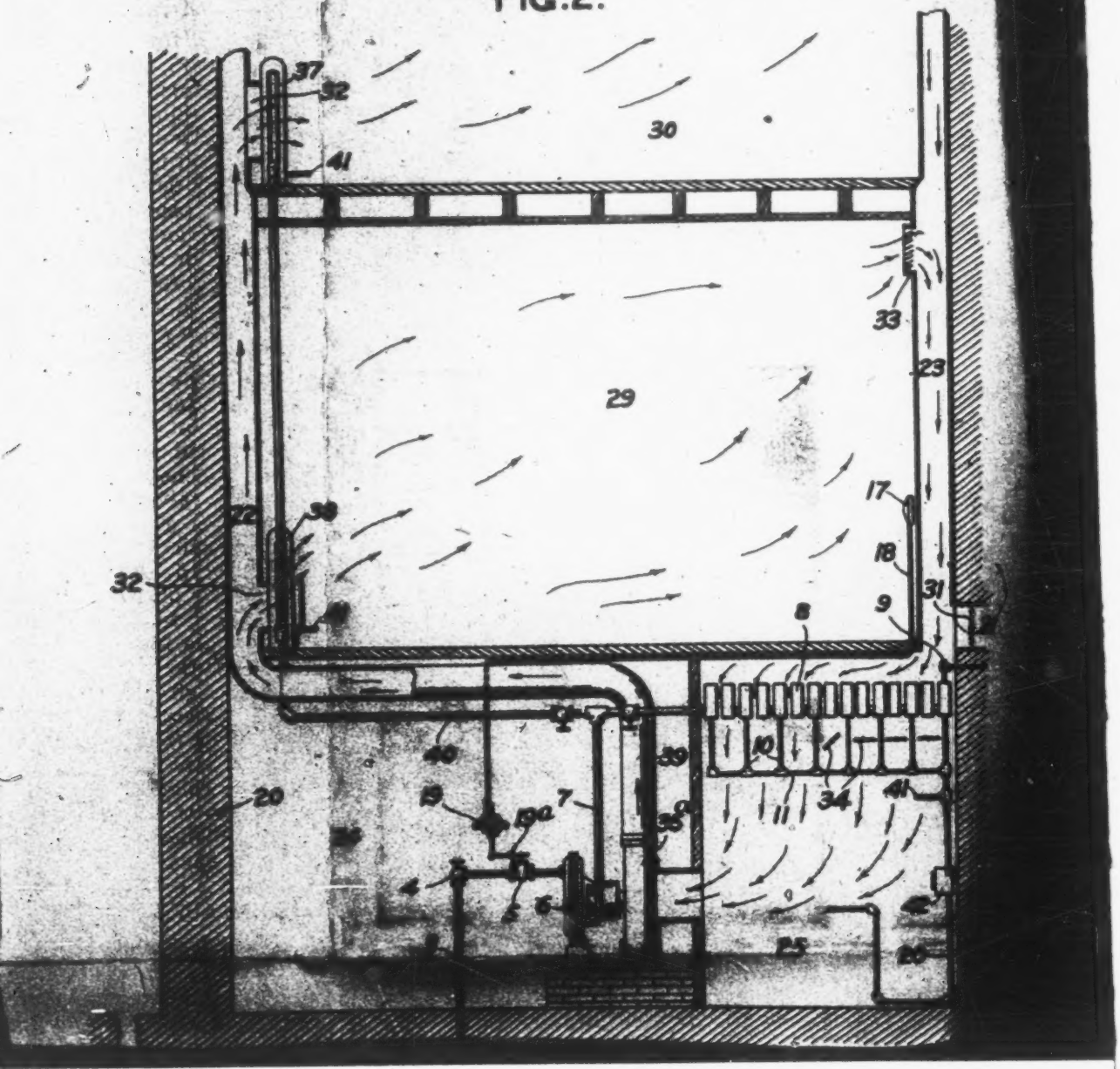
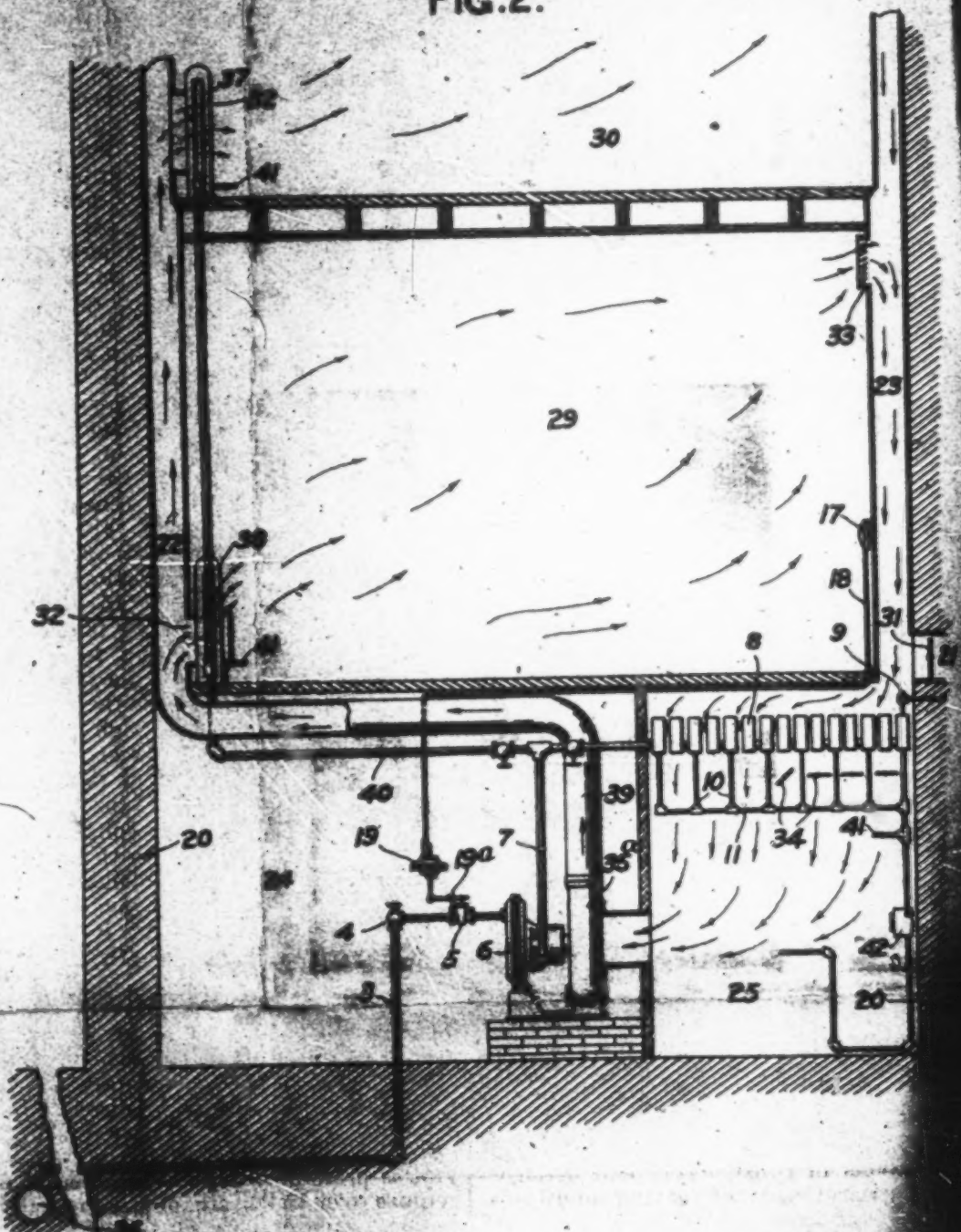


FIG. 2.



WITNESSES:
Emma W. Caulfield
William P. Bradley

INVENTOR
Cassius Carroll C

UNITED STATES PATENT OFFICE.

CASSIUS C. PECK, OF ROCHESTER, NEW YORK.

AUTOMATIC FAN SYSTEM OF HEATING.

No. 917,483. Specification of Letters Patent. Patented April 6, 1909.

Application filed March 3, 1908. Serial No. 418,[illegible].

To all whom it may concern:

Be it known that I, CASSIUS C. PECK, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Automatic Fan System of Heating, of which the following is a specification.

My invention relates to the class of heating apparatus in which a fan blower, or exhauster, is employed to circulate air in contact with heaters, and thence to the place of use.

Fan systems of heating by forced circulation of air are now extensively used for heating, and at the same time ventilating, public buildings, factories, drying rooms, etc., where an engineer is available for attending to the driving mechanism of the fan, the steam supply, and other operative details, but on account of requirement for an engineer such systems could not be used for ordinary residences and other similar situations.

The special object of my invention is to adapt a fan system to house heating, and this end is attained by first applying, in the form of steam, the heat required for warming purposes to driving the fan engine, and then using the exhaust of said engine for heating air supply of the fan, and returning water of condensation to the source of steam supply. Also in automatically supplying needful amount of steam and air, arranging the air heating surfaces so that practically all exhaust steam entering the air heater shall be condensed, and returning automatically resulting water of condensation to the source of steam supply, usually a steam boiler, the several steps and details being [illegible] on the accompanying drawing and [illegible] the following specification.

[illegible] drawings show in Figure 1 a vertical [illegible] of the mechanical elements [illegible] vention combined with a vertical [illegible] portion of a building main as shown at 36 in Fig. 2. The steam supply pipe 3, having stop valve 4, and automatically controlled throttling valve 5, derives the steam required for the heating system from typical engine 6, preferably of the turbine class, the exhaust from which passes through pipe 7 to indirect radiating sections 8, which are intended to represent any preferred type of air heating surface. It is essential, however, that in flowing through the heater the steam supply should follow a continuous course from the entrance end to the air discharge end, which has the check valve 9 usually discharging to atmosphere, the steam progressing in such way as to successively heat all the surfaces which it passes in regular succession from the entering point: In the heater as shown provision is made by branch pipes 10 connecting into the heater sections and into main drain pipe 11 for well draining the several sections, and for delivering water of condensation into return trap 12, having check valves 13 and 14, which symbolizes any form of return trap which provides for automatically returning the water through pipe 15 to boiler 1. Steam supply for equalizing pressure in the trap with that in the boiler, to allow water to flow by gravity from the former to the latter in accordance with the well known method, is provided through pipe 16. A thermostat 17, of any preferred design, is here shown as connected by tube 18 with a diaphragm 19, which actuates valve 5 through changes of atmospheric temperature in the room acting on the thermostat. Walls of the containing building are indicated by 20, the inlet passage for fresh air by 21, the hot air rising flue by 23, the fan-engine room by 35, and heating, or plenum, chamber by 25.

Steam turbine 6 is here shown as connected with the fan blower 35 by a belt 26 running over pulley 27 on the turbine and pulley 28 on the fan, but under suitable conditions the engine and fan may be direct connected

Application filed March 3, 1908. Serial No. 419,[illegible].

To all whom it may concern:

Be it known that I, CASSIUS C. PECK, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Automatic Fan System of Heating, of which the following is a specification.

My invention relates to the class of heating apparatus in which a fan blower, or exhauster, is employed to circulate air in contact with heaters, and thence to the place of use.

Fan systems of heating by forced circulation of air are now extensively used for heating, and at the same time ventilating, public buildings, factories, drying rooms, etc., where an engineer is available for attending to the driving mechanism of the fan, the steam supply, and other operative details, but on account of requirement for an engineer such systems could not be used for ordinary residences and other similar situations.

The special object of my invention is to adapt a fan system to house heating, and this end is attained by first applying, in the form of steam, the heat required for warming purposes to driving the fan engine, and then using the exhaust of said engine for heating air supply of the fan, and returning water of condensation to the source of steam supply. Also in automatically supplying needful amount of steam and air, arranging the air heating surfaces so that practically all exhaust steam entering the air heater shall be condensed, and returning automatically resulting water of condensation to the source of steam supply, usually a steam boiler; the several steps and details being shown on the accompanying drawing and described in the following specification.

The drawings show in Figure 1 a vertical front elevation of the mechanical elements of my invention combined with a vertical cross section of a portion of a building served thereby. Fig. 2 is a vertical elevation similar to Fig. 1, but showing certain modifications in construction and arrangement of apparatus to suit varying conditions.

Referring mostly to Fig. 1, the source of steam supply for heating will usually be a steam boiler, which is illustrated in the drawing by the numeral 1, having water line 2, except that in district systems of heating steam supply will be derived from a street main as shown at 36 in Fig. 2. The steam supply pipe 3, having stop valve 4, and automatically controlled throttling valve 5, derives the steam required for the heating system from typical engine 6, preferably of the turbine class, the exhaust from which passes through pipe 7 to indirect radiating sections 8, which are intended to represent any preferred type of air heating surface. It is essential, however, that in flowing through the heater the steam supply should follow a continuous course from the entrance end to the air discharge end, which has the check valve 9 usually discharging to atmosphere, the steam progressing in such way as to successively heat all the surfaces which it passes in regular succession from the entering point. In the heater as shown provision is made by branch pipes 10 connecting into the heater sections and into main drain pipe 11 for well draining the several sections, and for delivering water of condensation into return trap 12, having check valves 13 and 14, which symbolizes any form of return trap which provides for automatically returning the water through pipe 15 to boiler 1. Steam supply for equalizing pressure in the trap with that in the boiler, to allow water to flow by gravity from the former to the latter in accordance with the well known method, is provided through pipe 16. A thermostat 17, of any preferred design, is here shown as connected by tube 18 with a diaphragm 19, which actuates valve 5 through changes of atmospheric temperature in the room acting on the thermostat. Walls of the containing building are indicated by 20, the inlet passage for fresh air by 21, the hot air rising flue by 23, the fan-engine room by 35, and heating, or plenum, chamber by 25.

Steam turbine 6 is here shown as connected with the fan blower 35 by a belt 26 running over pulley 27 on the turbine and pulley 28 on the fan, but under suitable conditions the engine and fan may be direct-connected as shown in Fig. 2. Ordinary house heating boilers are available, as the fan-driven engine is preferably proportioned so as not to require over 15 lbs. steam pressure, and such boilers usually have steam pressure automatically controlled by a diaphragm acted on by said pressure, or by some equivalent mechanism for automatically operating the dampers and drafts according to steam requirements. As such provision for auto-

matically maintaining steam supply at the desired pressure to suit weather conditions is no part of my invention, it is not shown.

Operation of the system is as follows: Steam pressure from the source of steam supply being admitted to engine 6 by opening stop valve 4, the engine is thereby put in operation and drives fan 7, which circulates air in direction shown by arrows, that is first in contact with air heater 8, which is intended to be proportioned so as to suitably heat the air, flows through rising air flue 22, and registers 32 into and through rooms 29 and 30, from whence more or less of the air can be returned through registers 33 by flue 23 to the fan engine room 24 for recirculation. The proportion of fresh air used in the system is regulated by damper 31 in the fresh air inlet 21; and the supply of heated air to individual rooms may be controlled by said registers, which are provided with the usual shutter dampers. For regulating flow of air through heater 8 to suit varying conditions of weather, other dampers, 34 are provided to divert the current of air through such portion of the heater as is needful to condense the amount of steam which is being used. Water of condensation drains through pipes 10 into pipe 11, which is formed with a U trap to preserve a water seal between the several sections of the heater, and which conducts it to trap 12, which intermittently returns it to boiler 1. The office of thermostat 17 is to open and close the engine throttle valve 5 in accordance with heat requirements of the heating system by acting through diaphragm 19, lever 19a of which is attached to said valve. Thus when temperature of the room rises the thermostat is heated from the desired point, said thermostat acts to close throttle valve 5 in proportion to the amount of heat needed to maintain the desired temperature at the predetermined point. Fan 7 and fan engine 25 will operate at reduced current consuming but little power, pressure of steam entering engine and delivery of heat and air to the heater will therefore be

Heating surface in air heater 8 is intended to be proportioned so as to condense the steam admitted into said heater during maximum requirements for heat. At each of the heater opposite the admission end is provided with a vent pipe to atmosphere having an outwardly opening check valve 9, which can be loaded so as to carry any desired amount of back pressure on the engine to make up for small allowance of heating surface and maintain higher temperature in the heater to meet extreme requirements for heat. When starting the system, steam entering one end of the heater forces air in the heater before it to the opposite end where it finds egress under sufficient back pressure to open the check valve.

Because in case of turbine engines no oil mingles with exhaust steam, I much prefer to use this type of engine in some one of the forms in which it is, or may be, manufactured.

Special advantages of this system are that (a) it combines well controlled heating with any desired amount of ventilation; (b) that by proper arrangement of inlet and outlet registers, rooms can be evenly warmed from floor to ceiling, or more nearly so than in any system unprovided with mechanically forced circulation; (c) and that all heating apparatus can be avoided in occupied rooms.

The fan engine is preferably proportioned to commence running on very low steam pressures, say two or three pounds, which also provides for increasing speed as steam pressure is increased. Thus if steam pressure completely fails during the night, causing the engine and fan to stop, they will start automatically when light steam pressure has again been established; and the pressure to be maintained during hours of use will be determined by weather conditions, or other conditions governing requirement for heat; that is steam pressure will be increased in proportion as requirement for heat increases. Fan speed, consequent volume of air circulated, dependent on volume and pressure of [illegible] the fan engine there will also

I do not confine myself to the exact structure and arrangement of apparatus

supply being admitted to engine 6 by opening stop valve 4, the engine is thereby put in operation and drives fan 35 which circulates air in direction shown by arrows, that is first in contact with air heater 8, which is intended to be proportioned so as to suitably heat the air, then through rising air flue 22, and registers 32 into and through rooms 29 and 30. From whence more or less of the air can be returned through registers 33 by flue 23 to the fan engine room 24 for recirculation. The proportion of fresh air used in the system is regulated by damper 31 in the fresh air inlet 25; and the supply of heated air to individual rooms can be controlled by said registers, which are provided with the usual shutter dampers. For regulating flow of air through heater 8 to suit varying conditions of weather, gates, or dampers, 34 are provided to direct the current of air through such portion of the heater as is needful to condense the amount of steam which is being used. Water of condensation drains through pipes 10 into pipe 11, which is formed with a U trap to preserve a water seal between the several sections of the heater, and which conducts it to trap 12, which intermittently returns it to boiler 1. The office of thermostat 17 is to open and close the engine throttle valve 5 in accordance with heat requirements of the heating system by acting through diaphragm 19, on lever 19^a of which is attached to said valve. Thus when temperature of the room where the thermostat is located falls below the desired point, said thermostat acts to open throttle valve 5 in proportion to the amount of heat needed to maintain the room temperature at the predetermined point. Engine 22 and fan 35 will consequently be run at speed corresponding to the volume and pressure of steam entering the engine, and delivery of heat and air to the rooms will therefore be in corresponding proportion, thus maintaining the temperature of the rooms uniform [illegible] the double office of circulating air which conveys heat to the point where required, and of a reducing pressure valve for changing relatively high steam pressure to the lower pressures usually employed in heating systems.

While thermostatic control of the engine throttle is not indispensable, as the heating system can be operated by hand control of said throttle, or by connecting with the said throttle and regulating the steam valve 4, it constitutes a convenient means of rendering the system automatic in operation to maintain [illegible]

is provided with a vent pipe to atmosphere having an outwardly opening check valve 9, which can be loaded so as to carry any desired amount of back pressure on the engine to make up for small allowance of heating surface and maintain higher temperature in the heater to meet extreme requirements for heat. When starting the system, steam entering one end of the heater forces air in the heater before it to the opposite end where it finds egress under sufficient back pressure to open the check valve.

Because in case of turbine engines no oil mingles with exhaust steam, I much prefer to use this type of engine in some one of the forms in which it is, or may be, manufactured.

Special advantages of this system are that (*a*) it combines well controlled heating with any desired amount of ventilation; (*b*) that by proper arrangement of inlet and outlet registers, rooms can be evenly warmed from floor to ceiling, or more nearly so than in any system unprovided with mechanically forced circulation; (*c*) and that all heating apparatus can be avoided in occupied rooms.

The fan engine is preferably proportioned to commence running on very low steam pressures, say two or three pounds, which also provides for increasing speed as steam pressure is increased. Thus if steam pressure completely fails during the night, causing the engine and fan to stop, they will start automatically when light steam pressure has again been established; and the pressure to be maintained during hours of use will be determined by weather conditions, or other conditions governing requirement for heat; that is steam pressure will be increased in proportion as requirement for heat increases. Fan speed, and consequent volume of air circulated, being dependent on volume and pressure of steam entering the fan engine, there will always be a correct and corresponding balance between air and heat capacity applicable to the heating system.

I do not confine myself to the exact construction and arrangement of apparatus shown and described, as the essential features of the invention can be embodied in many different ways, and indeed require various modifications to suit varying local conditions of use. Thus in Fig. 2, an exhausting fan 35^a is subetituted for the forcing fan shown in Fig. 1, 35^a being arranged for drawing air by induction through the air heater 8 and then forcing it to the point of use; and air heaters 37 and 38 are located at the points where air is to be used for heating,

37 being of the direct type, and 38 of the direct-indirect type of heater, air being delivered from the fan 35ª through pipe 39 to the heaters, and exhaust steam from fan engine 6 being similarly conducted through pipe 40 to said heaters, the water of condensation therefrom returning through pipe 41 to meter 42, whence it goes to any place for use, or to waste.

What I claim and desire to secure by Letters Patent is:—

1. In a fan system of heating, the method of governing heat supply and delivery for the system by first using the steam required for supply of heat to the heating system to drive air-moving mechanism; condensing the exhaust steam from said mechanism in air heaters; moving air by said mechanism over the air heaters and delivering it to the space to be heated; and governing air and heat supply for the system by the speed at which the air-moving mechanism is made to run, substantially as set forth.

2. In a fan system of heating, the method of first using the amount of steam required for heating to drive the fan engine and connected fan by connecting the engine with a source of steam for driving it; delivering the engine exhaust into air heaters; connecting the fan with said heaters and delivering heated air forced by the fan to the place of use; governing speed of the combined engine and fan so as to supply the amount of heat and air required in the heating system; and automatically regulating said speed by thermostatic control.

3. In a fan system of heating, the method of first using the amount of steam required for supplying heat for the heating system to drive the fan engine with the attached fan by connecting the engine with a steam supply; using the exhaust steam from the engine in air heaters; delivering air from the fan to said heaters and to the place of use; automatically draining water of condensation from said air heaters and discharging it into the source of steam supply to the engine; and governing speed of the combined engine and fan to supply heat and air as required by the heating system.

4. The method of operating automatically a fan system of heating, consisting in connecting a fan engine, having an attached fan, to a source of steam supply; using the engine as a reducing valve to deliver into air heaters the reduced pressure steam needed to furnish the amount of heat required by the heating system; delivering air from the fan to said heaters and to the place of use; venting said heaters to atmosphere and automatically closing the vents against entrance of air; automatically draining water of condensation from said air heaters back into the source of steam supply to the fan engine; condensing in the heating system the pressure steam required in operating the drainage mechanism; and governing thermostatically the speed of the combined engine and fan to automatically supply the amount of heat and air required for the heating system.

5. In a fan system of heating, the method of using the fan engine as a reducing valve for reducing pressure of steam required to drive the fan engine by discharging the exhaust steam into air heaters; venting said heaters to atmosphere at the end opposite the steam inlet; condensing the steam in said heaters by guiding it in a continuously progressive course through successive portions constituting one or more passages of sufficient length to condense the steam before reaching the vented end; delivering air from the fan to said heaters and to the place of use; automatically draining water of condensation from said heaters; and governing speed of the combined engine and fan so as to supply heat and air in amount required by the heating system.

CASSIUS C. PECK.

Witnesses:
CHARLES L. WHITMORE,
JNO. H. MCANARNEY.

1022

T. B. FREAS.

HEATING SYSTEM FOR CONSTANT TEMPERATURE BATHS.

APPLICATION FILED MAR. 17, 1913.

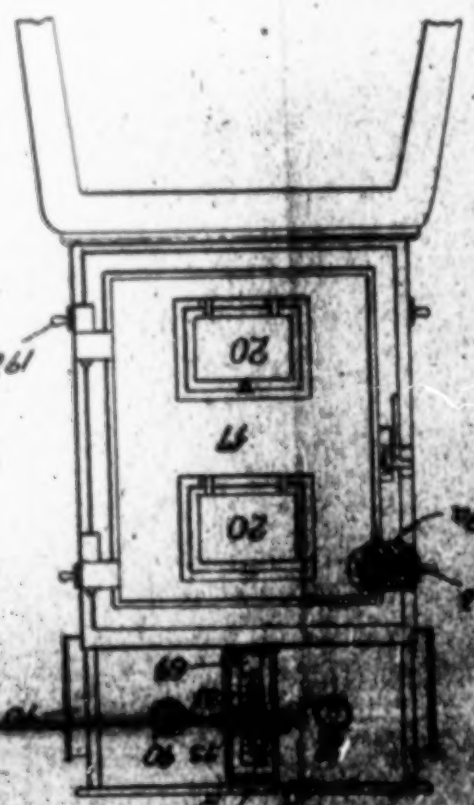
1,165,958.

Patented Dec. 28, 1915.

4 SHEETS—SHEET 1.

Fig. 2

Fig. 1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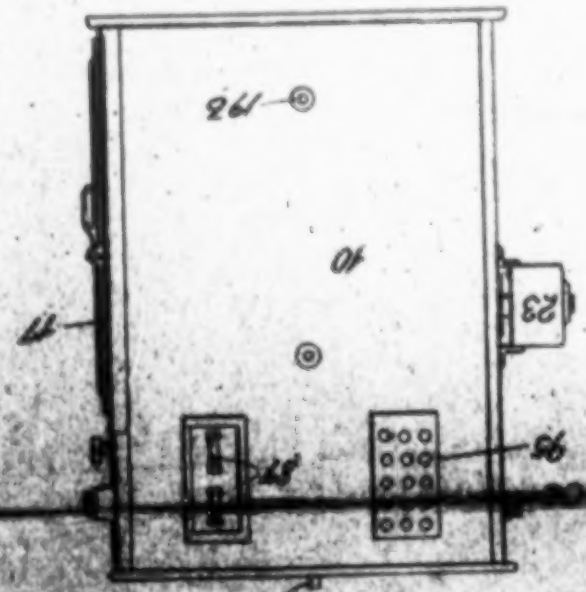
Thomas B. Lucas
Inventor

Fig. 2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Witnesses

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T. B. FREAS.

HEATING SYSTEM FOR CONSTANT TEMPERATURE BATHS.

APPLICATION FILED MAR. 17, 1913.

1,166,958.

Patented Dec. 28, 1913.

4 SHEETS—SHEET 2.

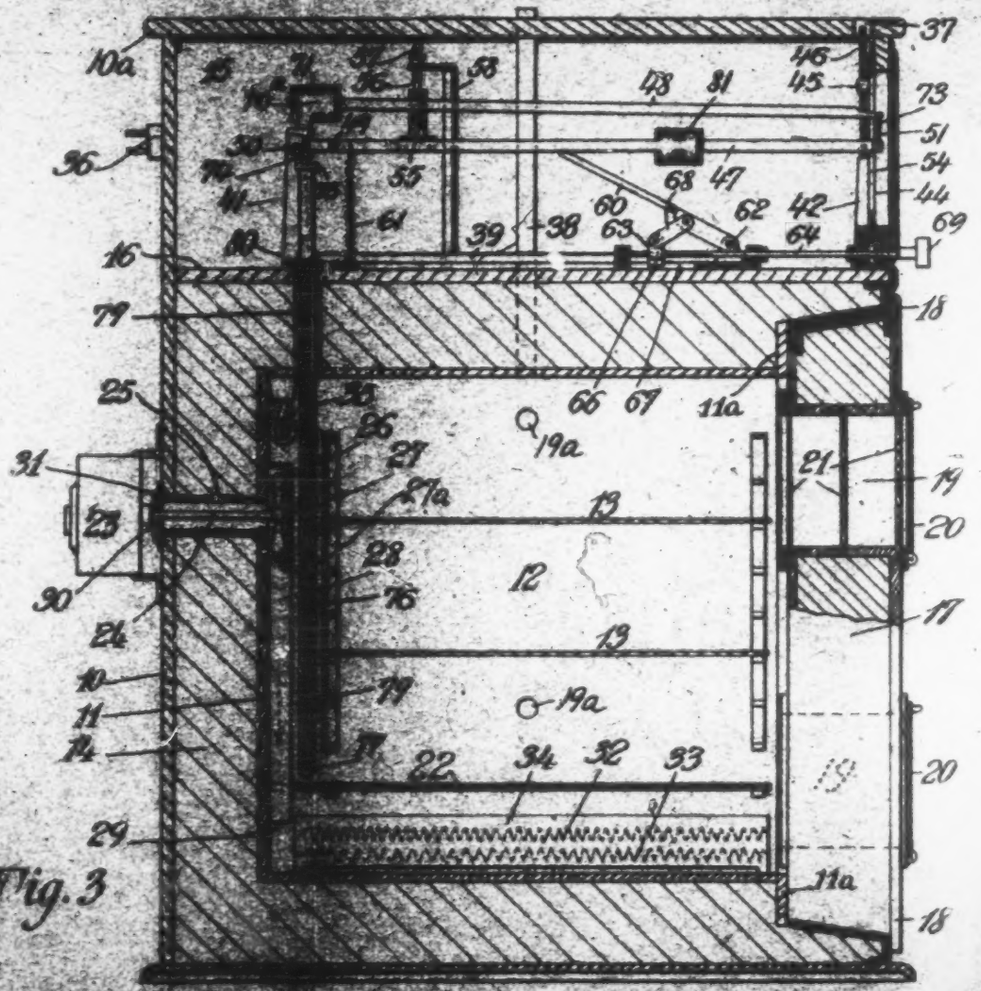


Fig. 3

1,100,805.

4 SHEETS—SHEET 2.

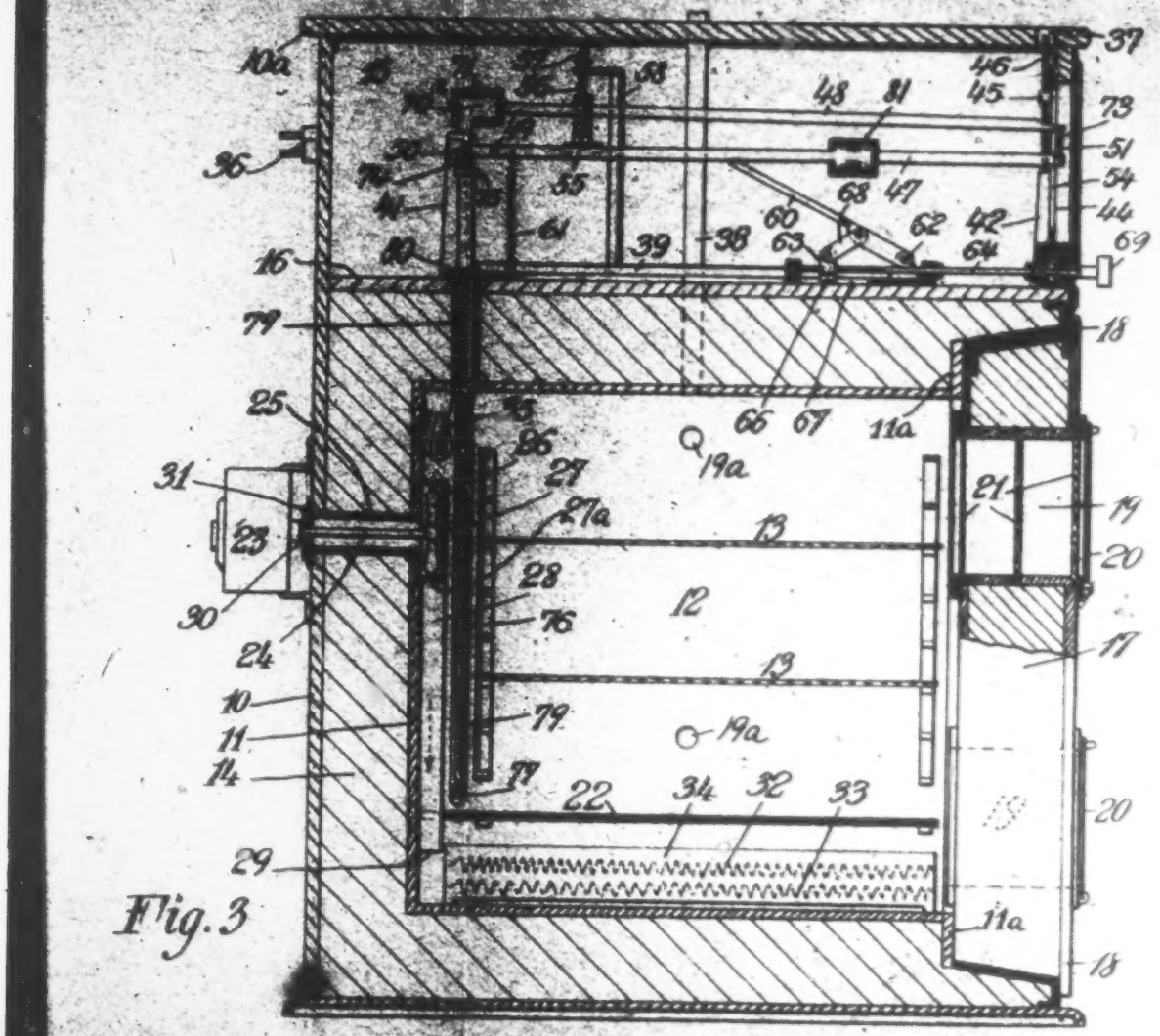


Fig. 3

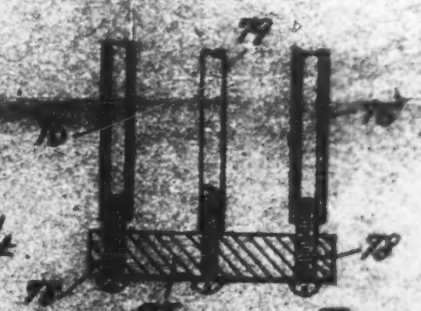


Fig. 4

Witnesses:
J. Konigsberg
C. F. Le Boutillier

Thomas B. Treas Inventor
By his Attorney
Benjamin C. Wooster

1024

T. B. FREAS.

HEATING SYSTEM FOR CONSTANT TEMPERATURE BATHS.

APPLICATION FILED MAR. 17, 1913.

1,165,958.

Patented Dec. 28, 1915.

4 SHEETS—SHEET 3.

Fig. 5

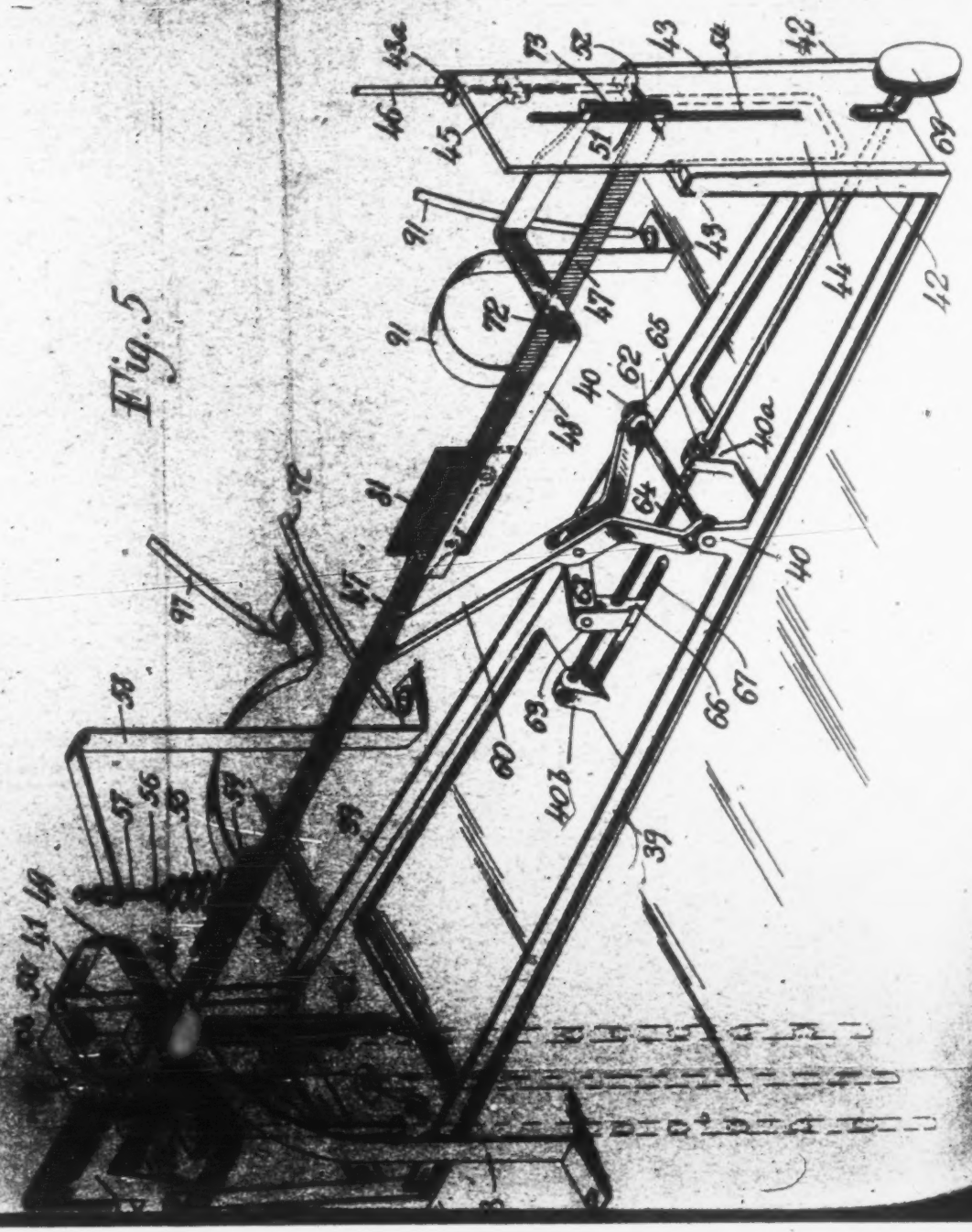
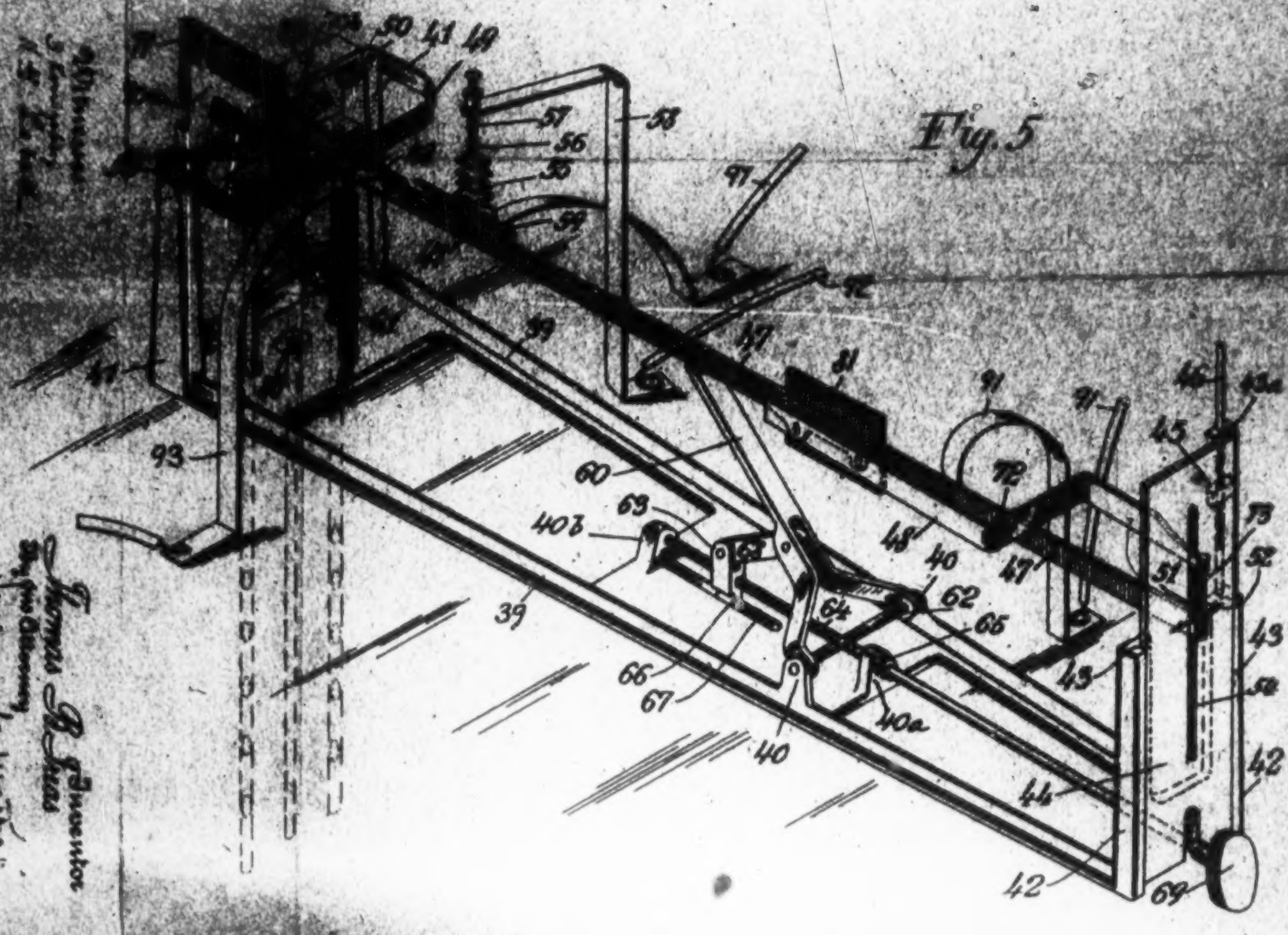


Fig. 5



Thomas B. Shaw
Inventor
by his Attorney
Harry G. Wattles

1025

T. S. FREAS.

HEATING SYSTEM FOR CONSTANT TEMPERATURE BATHS.

APPLICATION FILED MAR. 17, 1913.

1,165,958.

Patented Dec. 28, 1915.

4 SHEETS—SHEET 4.

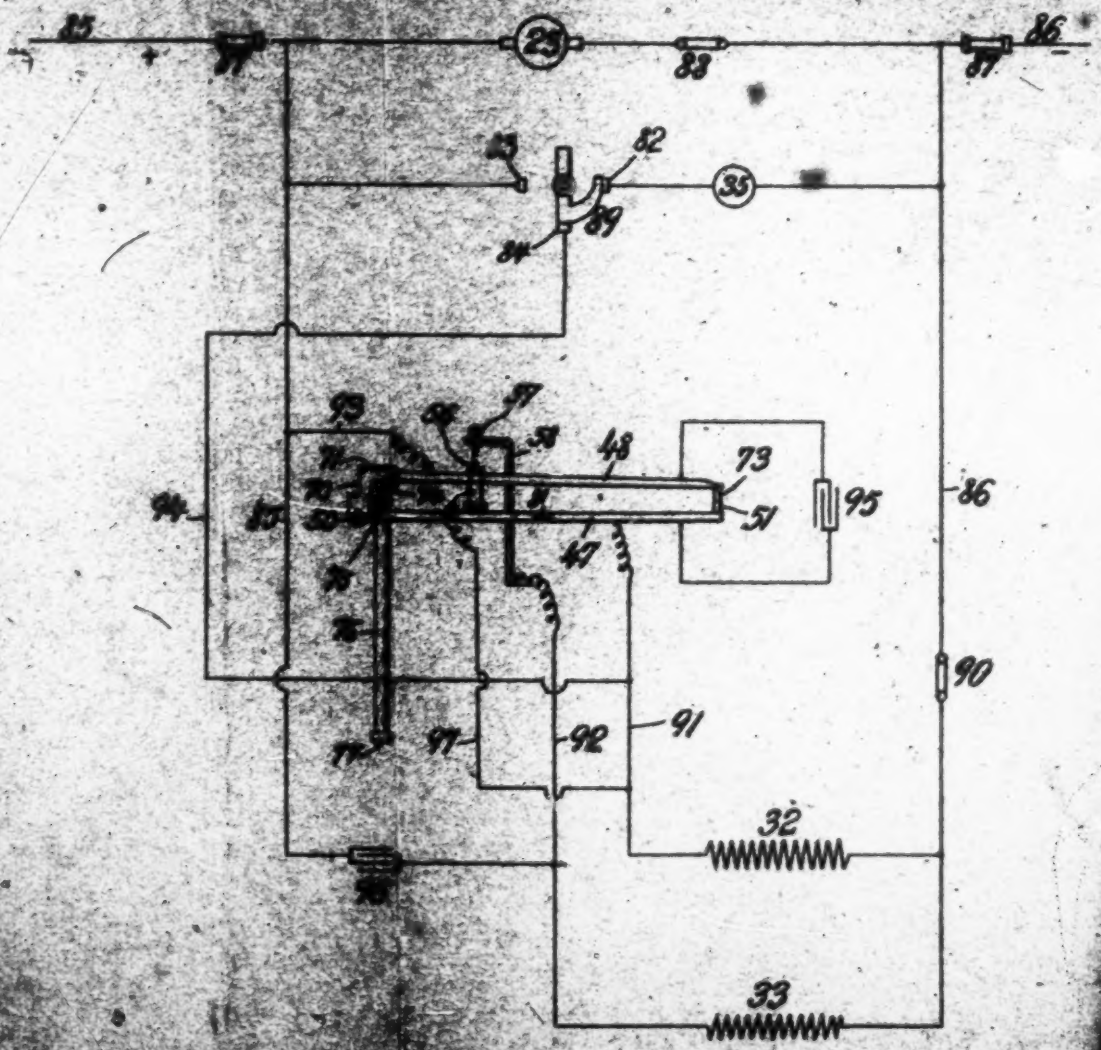


Fig. 6

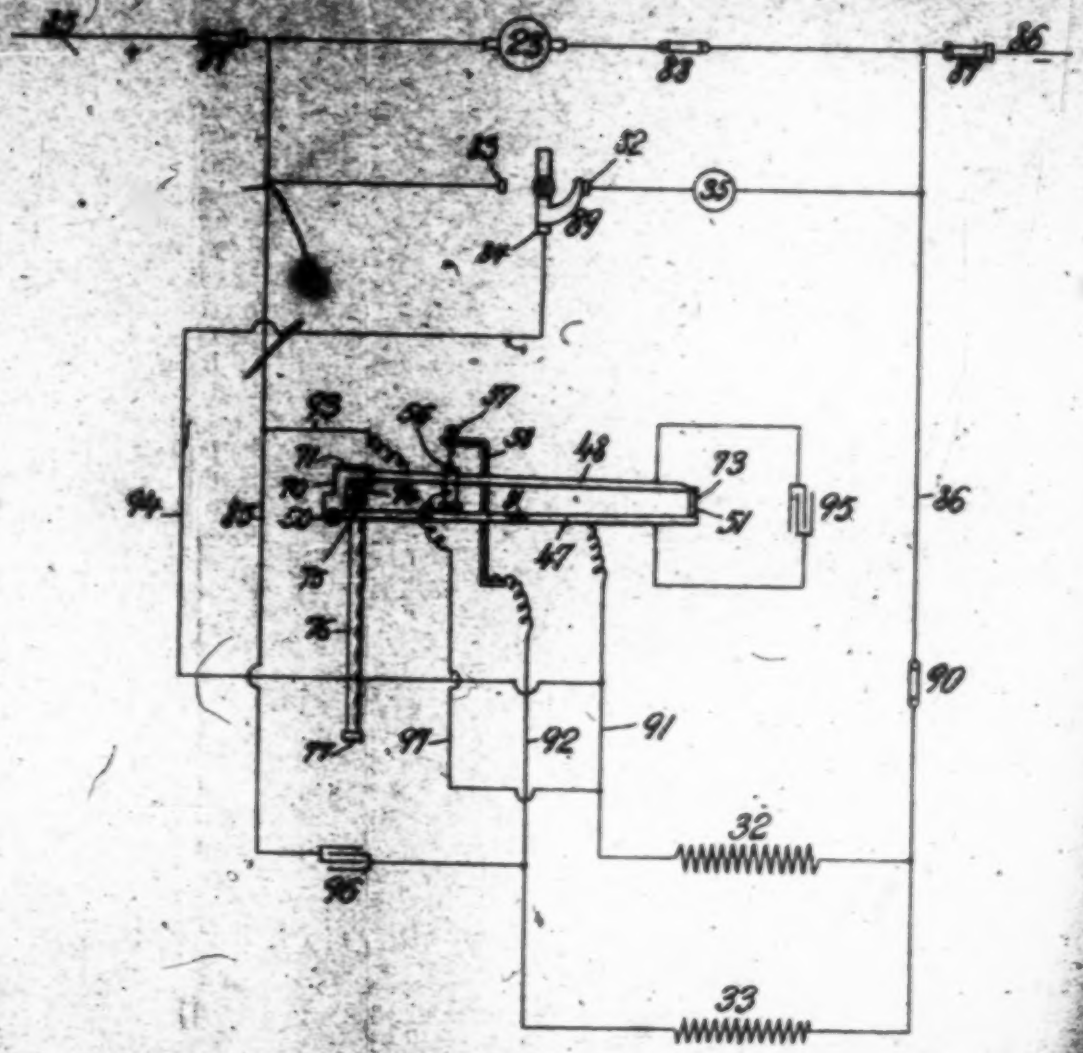


Fig. 6

Witnesses:

Thomas R. Lucas Inventor

By his Attorney

UNITED STATES PATENT OFFICE.

THOMAS B. FREAS, OF NEW YORK, N. Y., ASSIGNOR TO V. MUELLER & COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

HEATING SYSTEM FOR CONSTANT-TEMPERATURE BATHS.

1,165,958. Specification of Letters Patent. Patented Dec. 28, 1915.

Application filed March 17, 1913. Serial No. 754,717.

To all whom it may concern:

Be it known that I, THOMAS B. FREAS, a citizen of the United States of America, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Heating Systems for Constant-Temperature Baths, of which the following is a specification.

This invention relates to heating systems for constant-temperature baths of the type designed for use as chemical laboratory ovens, bacteriological incubators and other similar or analogous apparatus where such device finds application and the object of the invention is to provide means for maintaining the temperature accurately at any desired degree of heat irrespective of the changes of room temperature.

This invention is furthermore designed as an improvement upon the type of apparatus heretofore patented by me in U. S. Letters Patent No. 1,024,565, dated April 30, 1912.

In the following I have described, in connection with the accompanying drawings, a structure illustrating the application of the principles of my invention, the features thereof being more particularly pointed out hereinafter in the claims.

In the drawings Figure 1 is a front elevation of one form of constant-temperature bath illustrating the practice of the principles of my invention. Fig. 2 is a side elevation of the structure shown in Fig. 1, the support being omitted. Fig. 3 is a central vertical sectional view of the same, certain parts being shown in elevation. Fig. 4 is a detail view of the lower part of the thermostatic control. Fig. 5 is an isometric perspective view, on a somewhat enlarged scale, of the automatic switch mechanism and control devices in connection therewith and Fig. 6 is a diagrammatic view of the electri[illegible]iring system.

acid proof, fireproof and heat and electrically insulating character such as that which is known in the trade as asbestos wood or "transite." The space between the walls of the boxes is preferably filled with a suitable heat insulating material 14, such as cellular asbestos. The walls of the outer box are shown as extended upwardly to form, in connection with the top 10ª and the floor 16, a chamber 15 for the reception of the automatic switch mechanism and associated parts hereinafter described. The top 10ª and floor 16 are preferably of the same material as the walls.

17 is a door in the front of the casing, preferably having inwardly tapered edges adapted to form a tight joint with correspondingly tapered edges in the door frame. The edges of the door 17 and the door frame are each preferably made of metal cast in integral pieces respectively, each thus forming a unitary structure. The outer edges of the door are provided with a peripheral flange 18 to assist in preventing heat leaks.

19, 19 are observation openings closed by shutters 20, 20. The openings 19, are provided with windows 21, of any suitable transparent material not affected by the heat, such as a well annealed glass or mica.

19ª, 19ª are ventilation openings through the side walls of the casing, closed by spring plugs 19ᵇ, 19ᵇ.

The front and rear walls of the door are preferably of nonheat conducting material, such as asbestos wood, as is also the frames of the observation openings 19, so that the door presents no heat conducting surface adjacent the chamber 12 and the metal parts of the door and door frame are substantially insulated from [illegible]. It will be observed that the inner box 11 is provided with flanges 11ª which abut the inner metallic edges of the door and door frame and extend some distance beyond said edges thus

To all whom it may concern:

Be it known that I, THOMAS B. FRAAS, a citizen of the United States of America, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Heating Systems for Constant-Temperature Baths, of which the following is a specification.

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Similar numerals of reference indicate similar parts throughout the several views.

In the form selected to illustrate the invention, as shown in the drawings, the casing comprises an outer box 10 and an inner box 11, the latter forming a receiving chamber 12 wherein the objects to be acted upon are to be placed. Adjustable shelves 13, 13 are provided to divide the space in chamber 12 as desired. The material employed for the walls of the boxes should preferably be of an asbestos wood, fireproof and heat and electrically insulating material such as that which is known in the trade as asbestos wood or "transite." The space between the walls of the boxes is preferably filled with a suitable heat insulating material, such as cellular asbestos. The walls of the outer box are shown as extended upwardly to form, in connection with the top 10[a] and the floor 14, a chamber 15 for the reception of the automatic switch mechanism and associated parts hereinafter described. The top 10[a] and floor 14 are preferably of the same material as the walls.

17 is a door in the front of the casing, preferably having inwardly tapered edges adapted to form a tight joint with correspondingly tapered edges in the door frame. The edges of the door 17 and the door frame are each preferably made of metal cast in integral pieces respectively, each thus forming a unitary structure. The outer edges of the door are provided with a peripheral flange 18 to assist in preventing heat leaks.

19, 19 are observation openings closed by shutters 20, 20. The openings 19, are provided with windows 21, of any suitable transparent material not affected by the heat, such as a well annealed glass or mica.

19[a], 19[a] are ventilation openings through the side walls of the casing, closed by spring plugs 19[b], 19[b].

The front and rear walls of the door are preferably of nonheat conducting material, such as asbestos wood, as is also the frames of the observation openings 19, so that the door presents no heat conducting surface adjacent the chamber 12 and the metal parts of the door and door frame are substantially insulated from said chamber. It will be observed that the inner box 11 is provided with flanges 11[a] which abut the inner metallic edges of the door and door frame and extend some distance beyond said edges thus permitting no metal heat conducting part to come into proximity to the chamber 12. The space between the front and rear walls of the door is preferably filled with a nonheat conducting material such as cellular asbestos.

22 is a shelf of insulating material, the function of which will be explained hereinafter.

23 is a motor suitably supported on the rear outer wall of the casing, its armature

shaft 24 extending horizontally to the inside of the casing through a [illegible] sleeve 25. A centrifugal blower [illegible] is secured to the inner end of armature shaft 24 and is adapted to draw the air [illegible] chamber 12 through the opening [illegible] lower housing 27ª and to force it through a downward extension 28 of the blower housing and out at 29 into the lower part of the chamber 12 below the shelf 22 and through and over the heating elements 23 and 23ª which latter may be of any suitable form, as shown, 23 is the primary heating element and 23ª is the secondary heating element, each comprising a coil of wire of suitable resistance supported on a frame of [illegible] preferably of asbestos wood, in such manner as to permit free circulation of air around the same. At the outer end of sleeve 25 there is a disk provided with apertures 30 which may be opened or closed by turning a similarly apertured disk or cover 31 so as to establish communication between the outer air and the chamber 12 at the will of the operator in order that he may draw, by means of the blower 26, any desired quantity of fresh air into said chamber.

In the absence of the forced circulation of air the upper part of chamber 12 tends, through convection air currents, to become overheated and in the absence of insulating shelf 22, the lower part of chamber 12 tends, through the radiation of heat from the heating elements, to become overheated. The purpose of this forced circulation of air therefore within the chamber, is to provide a uniform distribution of the heated air within said chamber. The function of insulating shelf 22 is to prevent the heat radiating from the elements 23 and 23ª from disturbing this uniformity of heat produced by the forced circulation.

[illegible] chamber 12.

[illegible] for connecting the

[illegible] for the

[illegible] may

[illegible] reference

to cause lug or block 45 and its attach[illegible] scale face 44, to travel vertically. 48ª [illegible] a support mounted on standard 42 to for[illegible] a guide for the upper end of rod 46. Th[illegible] rear standards 41, 41, support the bearin[illegible] for the controlling levers 47 and 48. Th[illegible] lever 48 is shown as broken in Fig. 5 for t[illegible] sake of clearness. 49 is a yoke carryi[illegible] lever 47 and is pivoted at 50 in standards 4[illegible] The free end of lever 47 projects throu[illegible] slot 54 in scale face 44 and carries a co[illegible] tactor point 51 and a pointer 52 adapted [illegible] indicate on the temperature scale 53 o[illegible] scale face 44. (See Fig. 1). The division[illegible] of scale 53 may represent an arbitrary cali[illegible] bration or may represent a standard cali[illegible] bration in degrees of temperature. 55 is [illegible] flexible conductor mounted on lever 47 and[illegible] provided with a contactor 56 adapted to[illegible] contact with an adjustable contactor 57 on[illegible] conducting standard 58, suitable electrical[illegible] insulation 59 being interposed between conductor 55 and lever 47. Lever 47 rests upon a lifting arm 60 and is kept down taut on said arm by spring 61. Lifting arm 60 is pivoted on rod 62 supported in lugs 40 on the bed plate. 63 is a female threaded block engaging male threaded rod 64 mounted to rotate in bearings 40ª and 40ᵇ on bed plate 39 and secured against longitudinal movement by means of a collar 65. Block 63 carries a depending finger 66 which travels in a slot 67 in the bed plate 39 to prevent the block 63 from turning. A link 68 connects the block 63 and the lifting arm 60 as shown. The free end of the rod 64 projects through the front wall of the casing and through the scale face 44 as shown and is provided with an operating knob 69 so that the rod 64 may be rotated from without by the operator. Lever 48 is secured at one [illegible] to an arm 70ª on a rocker plate 70 but [illegible] insulated therefrom by means of suitable [illegible] lation 71. Rocker arm 70 is pivoted at [illegible] 50 to standards 41, 41. At 72 lever [illegible] offset so that the free end of the lever [illegible] extend through slot 54 in scale face 44 [illegible] the free end of lever 48 [illegible] a contactor 73 adapted to contact [illegible] tactor 51 on lever 47. Rocker pla[illegible] provided with an offset lug 70ᵇ [illegible] concave shaped bearing (not [illegible]

below the shelf [illegible] over the heating [illegible] which latter may be of any [illegible] shown, 33 is the primary [illegible] and 33 is the secondary heating [illegible] each comprising a coil of wire [illegible] supported on a frame [illegible] of asbestos wood, in such manner as to permit free circulation of air around the same. At the outer end of chamber 19 there is a disk provided with apertures 30 which may be opened or closed by turning a similarly apertured disk or cover 31 so as to establish communication between the outer air and the chamber 19 at the will of the operator in order that he may draw, by means of the blower 26, any desired quantity of fresh air into said chamber.

In the absence of the forced circulation of air the upper part of chamber 12 tends, through convection air currents, to become overheated and in the absence of insulating shelf 22, the lower part of chamber 12 tends, through the radiation of heat from the heating elements, to become overheated. The purpose of this forced circulation of air therefore within the chamber, is to provide a uniform distribution of the heated air within said chamber. The function of insulating shelf 22 is to prevent the heat radiating from the elements 32 and 33 from disturbing this uniformity of heat produced by the forced circulation.

35 is a lamp supported within chamber 12.

36 is an attachment cap for connecting the electric mains.

37 is an opening through cover 10ª for the purpose hereinafter described.

38, 38 are ventilating tubes leading from the chamber 19 through cover 10ª to the exterior and through which thermometers may be suspended.

Referring now to Figs. 3 and 5, reference numeral 39 indicates a bed plate secured to floor 16 and carrying bearings 40, 40, bearings 40ª, 40ª and standards 41, 41 and 42, 42 preferably cast therewith. Standards 42, 42 are provided with ways 43 for guiding the vertically adjustable scale face 44. Scale face 44 carries [illegible] by screw threaded lug or block [illegible] through which passes a threaded rod [illegible] mounted against vertical [illegible] standard 42. The top of rod 45 is provided with a slot so that, by means of a [illegible] inserted through opening 31, the rod may be rotated

lever 47 and is pivoted [illegible] The free end of lever 47 projects through slot 54 in scale face 44 and carries a contactor point 51 and a pointer 52 adapted to indicate on the temperature scale 53 on scale face 44. (See Fig. 1). The division of scale 53 may represent an arbitrary calibration or may represent a standard calibration in degrees of temperature. 55 is a flexible conductor mounted on lever 47 and provided with a contactor 56 adapted to contact with an adjustable contactor 57 on conducting standard 58, suitable electrical insulation 59 being interposed between conductor 55 and lever 47. Lever 47 rests upon a lifting arm 60 and is kept down taut on said arm by spring 61. Lifting arm 60 is pivoted on rod 62 supported in lugs 40 on the bed plate. 63 is a female threaded block engaging male threaded rod 64 mounted to rotate in bearings 40ª and 40ª on bed plate 39 and secured against longitudinal movement by means of a collar 65. Block 63 carries a depending finger 66 which travels in a slot 67 in the bed plate 39 to prevent the block 63 from turning. A link 68 connects the block 63 and the lifting arm 60 as shown. The free end of the rod 64 projects through the front wall of the casing and through the scale face 44 as shown and is provided with an operating knob 69 so that the rod 64 may be rotated from without by the operator. Lever 48 is secured at one end to an arm 70ª on a rocker plate 70 but is insulated therefrom by means of suitable insulation 71. Rocker arm 70 is pivoted at 50 to standards 41, 41. At 72 lever 48 is offset so that the free end of the lever will extend through slot 54 in scale face 44 above the free end of lever 47. Lever 48 carries a contactor 73 adapted to contact with contactor 51 on lever 47. Rocker plate 70 is provided with an offset lug 70ª having a concave shaped bearing (not shown) on its under side adapted to engage the upper end of a pin 74 rigidly carried by lug 75. The lug 70ª is offset with respect to the center of rotation of lever 48 about pivot 50, so that any vertical movement of pin 74 will cause lever 48 to rock and cause contactor 73 to move vertically a distance which distance compared with the vertical movement of pin 74, is according to the ratio of the distances of contactor 73 and pin 74 from the center of rotation 50. The position of bar 75 is so adjusted, by the means hereinafter described, that pin 74 will engage

...ave shaped bearing in lug 70 when the ...erature of thermostatic tubes 76 co... to the temperature at which the de... has been set as indicated by the point... on scale 53. The thermostatic device ... in part the thermostatic tubes 76, 76, made of a material adapted to expand and contract in response to variations in ...eratures, preferably of thin brass and ...ated. The tubes 76 are preferably ...ated to provide for a freer circulation ... in order to cause a quicker response to ...ges in temperature. The material of ... tubes 76 are made is such that the ... coefficient of expansion may be ob... consistent with strength and per...ency of form under varying conditions of ...erature. Brass has been found to give good results. The upper ends of tubes 76 are rigidly fastened to bar 75 and the lower ends of tubes 76 are connected with bar 77 by means of adjusting screws 78, 78. By means of these adjusting screws 78, 78, bar 75 carried by tubes 76, 76 may be vertically adjusted and thereby through pin 74, lug 70 and lever arm 48, adjust contactor 73 so that it may come within range of scale 53, the finer adjustment being made by the ...l movement of the scale face 44 as ... described. 79 indicates a rod ... material whose coefficient of expan... is practically nil. I have found invar (... of 36% nickel, 74% steel) to be a ...ry material for the purpose. Rod 79 ... lower end is attached to bar 77 and ... upper end is rigidly attached to the ... 30 at 80. As shown the connec... 79 to bar 77 is adjustable for the ... heretofore given in connection ... screws 78, 78.

... connections are shown dia... in Fig. 4. 85 and 86 indi... preferably provided with ... 30 is connected across ... controlled by a switch 88. ... across the mains and ... which 89 so that ... on the one ... directly ... may ... through con... 91 con... fore described in connection with primary heating element 32. Contactors 51 and 73 are protected, on breaking the circuit, by condenser 95 and contactors 56 and 57 are are similarly protected by condenser 96. When contactors 56 and 57 are closed, and the additional load of heating element 33 is on contactors 51 and 73, these latter contactors, on the breaking of the circuit, are protected by condenser 95 in addition to condenser 95.

In the operation of the apparatus described, the operator after closing switch 90, by means of operating knob 50 sets the pointers 52 at the desired temperature as indicated on the scale 53. Assuming that all parts are properly adjusted, if the temperature in the receiving chamber 12, and thus the temperature of the thermostatic tubes 76, 76, is below that of the indicated setting, contactor 73 will rest on contactor 51, thereby completing the electrical connection through primary heating element 32. The heat given off from element 32 circulating through chamber 12, freely by convection currents or forcibly by the forced draft of the blower 26, will raise the temperature of the thermostatic tubes 76, 76, which tubes will expand and, because of the non-expansion of rod 79, will cause bar 75 to rise and hence raise lever arm 48 and, on sufficient expansion of thermostatic tubes 76, 76, will break the current through contactors 73 and 51 and thus cut out heating element 32. Then, on the loss of a small quantity of the heat in chamber 12, the temperature of the thermostatic tubes 76, 76, will be lowered and a movement of a lever 48 opposite to that last described above will occur and the contactor 73 will again rest on contactor 51, thus throwing heating element 32 in again. Thus it will be seen that the heat of the chamber 12, which is continuously being lost by conduction through the walls, even though these latter be of the best possible insulation, will be intermittently replaced by means of heating ... The capacity of heating element 32, for the more or less low temperatures, should be as low as possible consistent with the amount of heat required, because, for accurate regulation, the quan-

...ted to provide for a freer circulation ... order to cause a quicker response ... in temperature. The material of ... tubes 76 are made is such that the ... coefficient of expansion may be ob... consistent with strength and per... of form under varying conditions ... perature. Brass has been found to ... good results. The upper ends of tubes ... rigidly fastened to bar 75 and the ... ends of tubes 76 are connected with ... by means of adjusting screws 78, 78. ... means of these adjusting screws 78, 78, ... carried by tubes 76, 76 may be verti... adjusted and thereby through pin 74, ... and lever arm 48, adjust contactor ... that it may come within range of scale ... finer adjustment being made by the ... movement of the scale face 44 as ... before described. 79 indicates a rod ... material whose coefficient of expan... practically nil. I have found invar ... of 36% nickel, 74% steel) to be a ... material for the purpose. Rod ... lower end is attached to bar 77 and ... upper end is rigidly attached to the ... 29 at 80. As shown the connec... rod 79 to bar 77 is adjustable for the ... purpose heretofore given in connection ... adjustable screws 78, 78.

... electrical connections are shown dia... ...ically in Fig. 6. 85 and 86 indi... ... mains, preferably provided with ... 87, 87. Motor 23 is connected across ... mains and controlled by a switch 88. ... 36 is connected across the mains and controlled by a two-way switch 89 so that the lamp 36 may be connected on the one hand, through contacts 82 and 83, directly across the mains or, on the other hand, may be connected across the mains through contacts 82 and 84, wire 94, conductor 91, contactors 51 and 73, lever 48 and conductor 93. Wire 86 is connected to heating elements 32 and 33 through switch 90. Primary heating element 32 is connected by means of conductor 91 to lever arm 47 which latter is divided electrically into two parts by insulator 81. From lever arm 47 the path of the current is through contactors 51 and 73, lever arm 48 and conductor 93 to main 85. Secondary heating element 33 is connected by means of conductor 92, conducting standard 58, conductors 97 and 98 and wire 97 to conductor 91 and thence by the path hereinbefore protected by condenser 96 in addition to condenser 95.

In the operation of the apparatus described, the operator after closing switch 90, by means of operating knob 59 sets the pointers 52 at the desired temperature as indicated on the scale 53. Assuming that all parts are properly adjusted, if the temperature in the receiving chamber 12, and thus the temperature of the thermostatic tubes 76, 76, is below that of the indicated setting, contactor 73 will rest on contactor 51, thereby completing the electrical connection through primary heating element 32. The heat given off from element 32 circulating through chamber 12, freely by convection currents or forcibly by the forced draft of the blower 26, will raise the temperature of the thermostatic tubes 76, 76, which tubes will expand and, because of the non-expansion of rod 79, will cause bar 75 to rise and hence raise lever arm 48 and, if sufficient expansion of thermostatic tubes 76, 76, will break the current through contactors 73 and 51 and thus cut out heating element 32. Then, on the loss of a small quantity of the heat in chamber 12, the temperature of the thermostatic tubes 76, 76, will be lowered and a movement of a lever 48 opposite to that last described above will occur and the contactor 73 will again rest on contactor 51, thus throwing heating element 32 in again. Thus it will be seen that the heat of the chamber 12, which is continuously being lost by conduction through the walls, even though these latter be of the best possible insulation, will be intermittently replaced by means of heating elements 32 operating as hereinbefore described. The capacity of heating element 32, for the more or less low temperatures, should be as low as possible consistent with the amount of heat required, because, for accurate regulation, the quantity of heat thrown in intermittently should have a low ratio to the quantity of heat lost continuously through the walls, otherwise a comparatively large quantity of intermittent heat thrown in would cause a comparatively large fluctuation of the temperature of chamber 12. Now when it is desired to operate at higher temperatures, additional heat is necessary. Therefore, when the operator sets the pointers 52 at a more or less high temperature, lever 47 will carry contactor 56 into contact with contactor 57, thereby throwing secondary heating element 33 into

direct connection with conductor 91 and thus parallel with heating element 22. This heating element 25 is thereafter controlled in a manner similar to that described in connection with heating element 22.

Lamp 35 may be connected directly across the mains as described, whenever it is desired to obtain illumination in chamber 12 continuously, the operator of course not permitting the heat furnished by the lamp to overheat the chamber as might occur with use at low temperatures. In order to use the lamp for observation where there is danger of its heat overheating the chamber, it is connected across the mains by means of wire 94 as described and thus the thermostatic control will not permit overheating in the chamber. In addition, the lamp connected in this latter manner, furnishes the operator with a convenient tell-tale or pilot to inform the operator, by means of the flashes of the lamp, that the apparatus is in proper working order.

It will be observed that levers 47 and 48 rotate on a common center 50, 50. This method of construction causes the contacting surfaces of contactors 51 and 73 to be always in parallel and thus in good electrical contact, regardless of their position on the scale.

The method herein described of adjusting the thermostatic control and of permitting the operator to set the temperature of the chamber 12 at any desired predetermined point as indicated to him by pointers 52 on scale 53, is a very important point in thermostatic construction.

It is obvious that additional heating elements similar to element 22 may be provided without departing from the spirit of the invention, it being understood that the contactors 51 and 73 may be adjusted to suit any required number of heat in assist the primary heating element.

It should be further observed that the [illegible] blower 26 are to [illegible] which it is possible to obtain. When best uniformity of [illegible] desired the motor may re[illegible] insulating plate 29 may

air being drawn in by blower 26 from top of the chamber, passed down along rear wall, over the heating elements an in a forced draft adjacent the door thence to the top of the chamber and a around through the blower as described.

Inasmuch as the door is the part of apparatus which suffers the greatest los heat, it is a very desirable feature to c the air which has just been passed over heating elements to be brought immedia to the coolest portion of the bath to co teract in some degree this unavoidable uniformity.

I do not restrict myself to any of the tails of construction, arrangement of pa or composition of material as shown or scribed further than the scope of the pended claims demands.

What I claim and desire to secure by Le ters Patent is:

1. In apparatus of the class described, receiving chamber, a thermostat control by the temperature of said chamber, a port, a lever arm having one end pivo to said support, means for actuating lever arm controlled by said thermostat, contactor on the other end of said lever from said pivotal point and distant f said thermostat, a second lever arm hav one end pivoted to said support con trically with the pivoted end of said mentioned lever arm, a contactor on second lever arm in the path of the tactor on the first mentioned lever arm an electric heating element in circuit said contactors.

2. In apparatus of the class descri receiving chamber, a thermostat co by the temperature of said chamber, adapted to be moved by said therm rocker plate in the path of move said pin, a lever arm carried by sai plate, a contactor on said lever a point distant from said pin, a sec tactor in the path of said first [illegible] tactor and an electric heating [illegible] circuit with said contactors.

3. In apparatus of this class de receiving chamber, a pair of le means controlled by the temperatur receiving chamber for automatic [illegible] the movement of one of

mitting the heat furnished by the lamp to overheat the chamber as might occur with use at low temperatures. In order to use the lamp for observation where there is danger of its heat overheating the chamber, it is connected across the mains by means of wire 24 as described and thus the thermostatic control will not permit overheating in the chamber. In addition, the lamp connected in this latter manner, furnishes the operator with a convenient tell-tale or pilot to inform the operator, by means of the flashes of the lamp, that the apparatus is in proper working order.

It will be observed that levers 47 and 48 rotate on a common center 50, 50. This method of construction causes the contacting surfaces of contactors 51 and 73 to be always in parallel and thus in good electrical contact, regardless of their position on the scale.

The method herein described of adjusting the thermostatic control and of permitting the operator to set the temperature of the chamber 12 at any desired predetermined point as indicated to him by pointers 52 on scale 53, is a very important point in thermostatic construction.

It is obvious that additional heating elements similar to element 38 may be provided without departing from the spirit of the invention, it being understood that the contactors 56 and 57 may be adjusted to suit any required inflow of heat to assist the primary heating element.

It should be further observed that the motor 28 and its attached blower 26 are to be operated only at times when the operator desires the greatest uniformity of temperature in chamber 12 which it is possible to obtain. When less uniformity of temperature is desired the motor may remain idle and the insulating plate 22 may be removed, thus permitting the convection currents of air and the radiated heat from the heating elements to create whatever uniformity of temperature it may.

Insulating plate 22 should fit tightly against the rear and side walls of receiving chamber 12, a space being left between the front edge of plate 22 and the door 17 to provide an exit for the air which has been blown into the space beneath plate 22 by blower 26. By this means the air in the receiving chamber is kept in constant circulation adjacent the walls of the chamber, the air which has just been passed over heating elements to be brought immedia to the coolest portion of the bath to co teract in some degree this unavoidable uniformity.

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3. In apparatus of the class de receiving chamber, a pair of lev means controlled by the temperature receiving chamber for automatica trolling the movement of one of sa arms, a support to which each of s arms is concentrically pivoted wit ence to the other, a contactor carried of said lever arms adapted to mak with each other and a heating e direct circuit with said contactors.

4. In apparatus of the class de pair of vertically movable contacto mary heating element in circuit contactors, a secondary heating e parallel with said primary heating a contactor insulated from said pair

tactors but controlled by the movement of one of said pair of contactors, a connection from said insulated contactor to that one of the pair of contactors controlling its movement, a contactor in the path of movement of said insulated contactor and a connection from said secondary heating element to said last named contactor.

5. In apparatus of the class described, a pair of vertically movable contactors adjacent each other, the movement of one of said contactors being automatically controlled and the movement of the other positively controlled, a secondary contactor electrically adjacent said positively controlled contactor and moving therewith, a contactor in the path of said secondary contactor, a primary heating element in circuit with said pair of contactors and a secondary heating element adapted to be brought into parallel with said primary heating element when said secondary contactors are in contact.

6. In apparatus of the class described, an air circulation system comprising a main chamber, a blower near the top of said chamber an air passage from said blower to the bottom of said chamber, a secondary air chamber at the bottom of said main chamber into which said air passage from the blower discharges, heat insulating means between said secondary chamber and main chamber, a discharge opening from said secondary chamber into said main chamber at a point opposite the exit from the air passage from the blower and a heating element in said secondary chamber.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS B. FREAS.

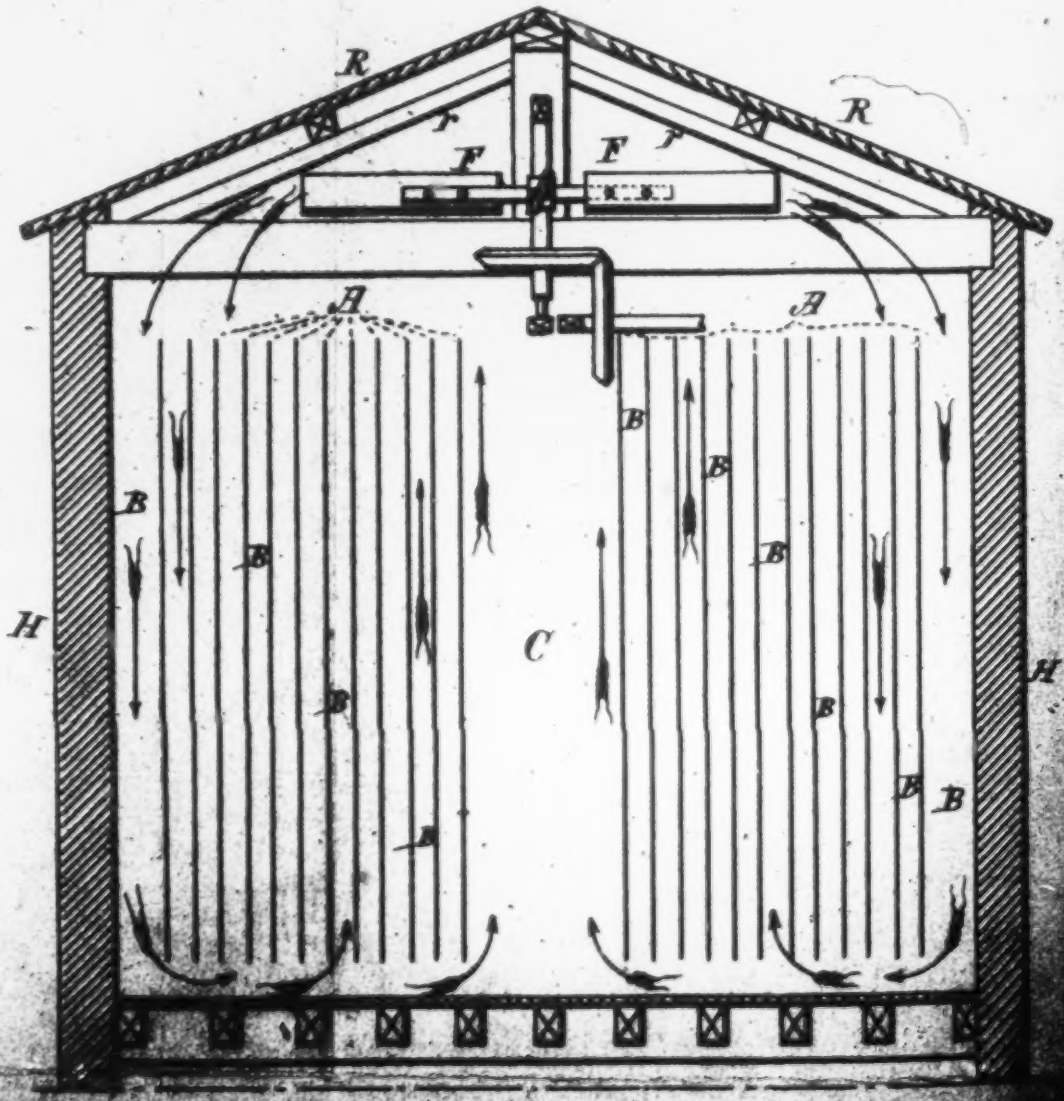
Witnesses:
SEABURY C. MASTICK,
H. G. LEARD.

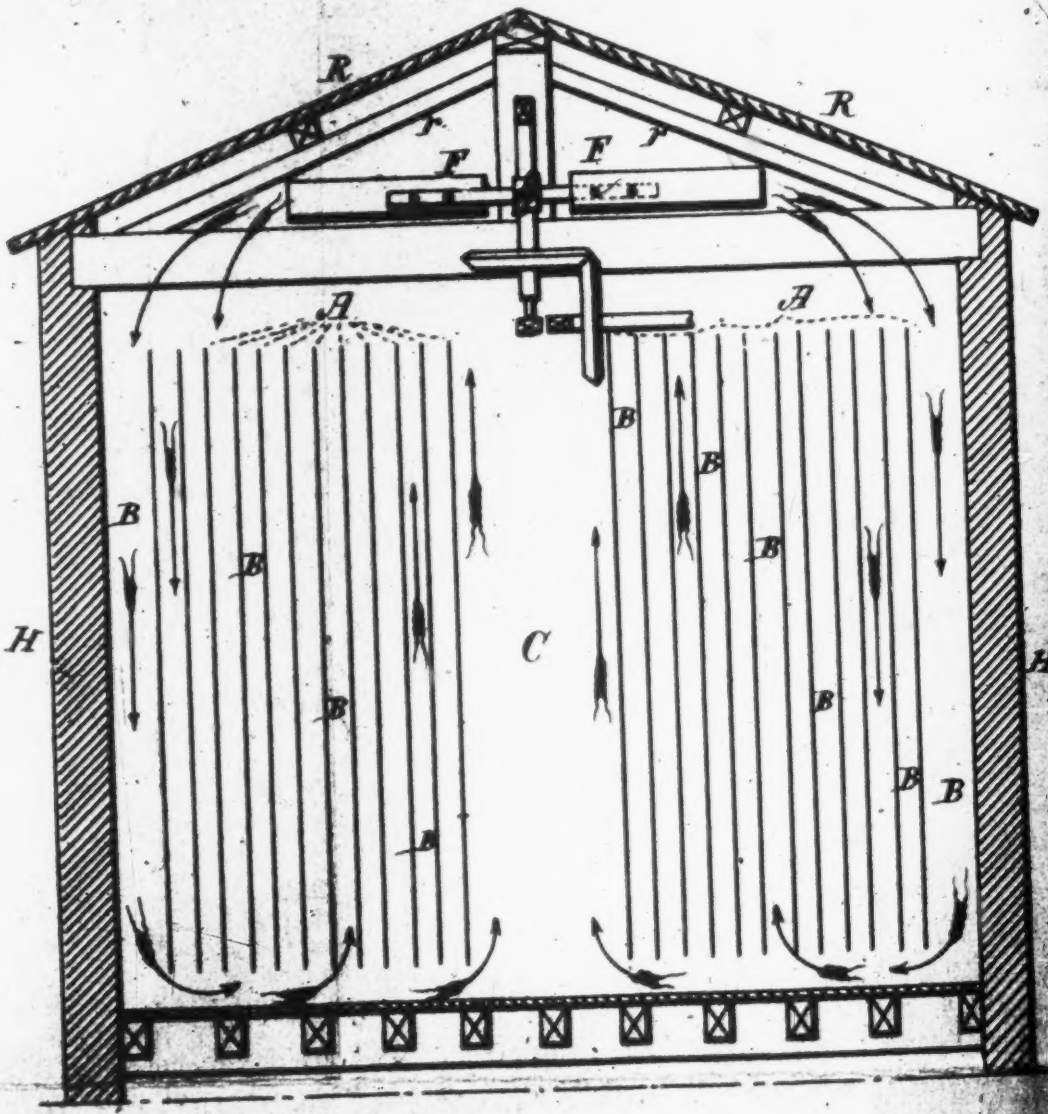
1031

O. LUMPP.

METHOD OF AND MEANS FOR DRYING MATERIALS OF EXTENSIVE SUPERFICIAL AREA.

No. 280,490. Patented July 3, 1883.





Witnesses
William L. Poulter
G. H. Knotts

Inventor
Oscar Fuller
per Henry Miller
his atty

UNITED STATES PATENT OFFICE.

OSCAR LUMPP, OF LYONS, FRANCE.

METHOD OF AND MEANS FOR DRYING MATERIALS OF EXTENSIVE SUPERFICIAL AREA.

SPECIFICATION forming part of Letters Patent No. 290,490, dated July 8, 1883.

Application filed March 17, 1883. (No model.) Patented in France October 20, 1882, No. 151,652.

To all whom it may concern:

Be it known that I, OSCAR LUMPP, a citizen of the French Republic, and resident of Lyons, in the French Republic, have invented certain new and useful Improvements in Methods and of Means for Drying Materials of Extensive Superficial Area, (for which I have obtained Letters Patent in France, No. 151,652, under date of October 20, 1882;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The object of this invention is to establish continuous ascending and descending currents of air in such structures in which materials of extensive superficial area are to be dried—such as hides, cloth, or other textile or fibrous materials in large sheets or stripe—where horizontal currents of air are not available, and even were such available, they would be difficult of establishing, and where vertical or ascending currents alone produce but slow and imperfect results. In the drying of materials such as described above, and more especially in the drying of hides, it is desirable that the operation should be effected as rapidly as possible. This cannot be done with hot air, such being injurious to hides, nor can it be done by horizontal or ascending air-currents. To effect this drying rapidly the entire surface of the material should be exposed to both ascending and descending currents.

The object of my invention is attained by means of a suitable ventilating or suction and blast fan in combination with deflecting-surfaces, said fan being arranged above the material to be dried and centrally thereof, drawing the air up and throwing the latter against [illegible] that will cause it to flow [illegible] jected, deflected thereby, and caused to flow from the roof to the floor below.

The hides A are suspended from rafters, (which I deemed unnecessary to show in the drawing,) at a short distance from one another, thus forming a series of narrow passages, B. Immediately below the fan, and in a line with the axis thereof and the apex of the angle formed by the deflecting-surfaces *r*, the distance between the adjacent hides is greater than that between the succeeding series of hides on opposite sides of this central passage, C, so as to produce a strong and voluminous upward current by the revolution of the fan. This current is projected by the fan F upon the inclined surfaces *r* of the roof, deflected downward thereby, as shown by the arrows, and, after reaching the series of hides, is divided thereby and passes downward through the passages B, formed between two rows of hides, to be drawn up again by the fan through the central passage, C. Of course more or less air will also be drawn up through some of the narrower passages, and in this manner I can effect the drying of hides in a comparatively short time and at a trifling expense. As shown, the fan rotates in suitable supports, and may be driven by toothed gearing or pulley and belt or any other suitable power-transmitting mechanism from any desired prime motor. Such fan may be of any usual or preferred construction, so long as it is arranged with regard to the deflecting-surfaces as described hereinabove.

Of course it will be readily understood that the same results may be obtained with any other material than hides, provided such material is composed of long strips or sheets capable of being suspended vertically to form the air-passages; and for some materials hot instead of cold air may be used, the hot air being injected into the lower part of the structure and caused to circulate as described.

Having thus described my invention, what

SPECIFICATION forming part of Letters Patent No. 280,490, dated July 3, 1883.

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To all whom it may concern:

Be it known that I, OSCAR LUMPP, a citizen of the French Republic, and resident of Lyons, in the French Republic, have invented certain new and useful Improvements in Methods and of Means for Drying Materials of Extensive Superficial Area, (for which I have obtained Letters Patent in France, No. 151,652, under date of October 20, 1882;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The object of this invention is to establish continuous ascending and descending currents of air in such structures in which materials of extensive superficial area are to be dried—such as hides, cloth, or other textile or fibrous materials in large sheets or strips—where horizontal currents of air are not available, and even were such available, they would be difficult of establishing, and where vertical or ascending currents alone produce but slow and imperfect results. In the drying of materials such as described above, and more especially in the drying of hides, it is desirable that the operation should be effected as rapidly as possible. This cannot be done with hot air, such being injurious to hides, nor can it be done by horizontal or ascending air-currents. To effect this drying rapidly the entire surface of the material should be exposed to both ascending and descending currents.

The object of my invention is attained by means of a suitable ventilating or suction and blast fan in combination with deflecting-surfaces, said fan being arranged above the material to be dried and centrally thereof, drawing the air up and throwing the latter against deflecting-surfaces that will cause it to flow downward in currents divided by the suspended material, whereby the entire surface thereof is exposed to its drying influence.

In the accompanying drawings I have shown in vertical section a drying-house, H, for tanneries, having a gable roof, R, the inner faces, *r*, of which form deflecting-surfaces, against which the air, drawn up by a fan, F, is projected, deflected thereby, and caused to flow from the roof to the floor below.

The hides A are suspended from rafters, (which I deemed unnecessary to show in the drawing,) at a short distance from one another, thus forming a series of narrow passages, B. Immediately below the fan, and on a line with the axis thereof and the apex of the angle formed by the deflecting-surfaces *r*, the distance between the adjacent hides is greater than that between the succeeding series of hides on opposite sides of this central passage, C, so as to produce a strong and voluminous upward current by the revolution of the fan. This current is projected by the fan F upon the inclined surfaces *r* of the roof, deflected downward thereby, as shown by the arrows, and, after reaching the series of hides, is divided thereby and passes downward through the passages B, formed between two rows of hides, to be drawn up again by the fan through the central passage, C. Of course more or less air will also be drawn up through some of the narrower passages, and in this manner I can effect the drying of hides in a comparatively short time and at a trifling expense. As shown, the fan rotates in suitable supports, and may be driven by toothed gearing or pulley and belt or any other suitable power-transmitting mechanism from any desired prime motor. Such fan may be of any usual or preferred construction, so long as it is arranged with regard to the deflecting-surfaces as described hereinabove.

Of course it will be readily understood that the same results may be obtained with any other material than hides, provided such material is composed of long strips or sheets capable of being suspended vertically to form the air-passages, and for some materials hot instead of cold air may be used, the hot air being injected into the lower part of the structure and caused to circulate as described.

Having thus described my invention, what I claim is—

1. The herein-described method of drying materials of extensive superficial area, which consists in suspending the same vertically in a chamber, to form narrow air-passages between them on opposite sides of a wide central passage formed by said suspended material,

drawing air upward through the wide central passage, projecting the air drawn up against deflecting-surfaces to deflect the said air downwardly toward the opposite sides of the wide central passage, substantially as described, for the purposes specified.

2. In an apparatus for drying materials of extensive superficial area, a drying chamber or house having its roof formed by deflecting-surfaces inclined downwardly in opposite directions, a ventilating-fan located centrally of and in proximity to said deflecting-surfaces, the material to be dried being suspended below said fan in rows on opposite sides of a vertical line passing through the apex of the angle formed by the deflecting-surfaces, to form air-passages between such rows of material, as described.

In testimony that I claim the foregoing I have hereunto set my hand this 15th day of February, 1883.

OSCAR LUMPP.

Witnesses:
J. P. A. MARTIN,
BENJAMIN F. PEIXOTTO.

1034

(No Model.)

W. H. ROGERS.

DRIER.

No. 327,900. Patented Oct. 6, 1885.

Fig. 1.

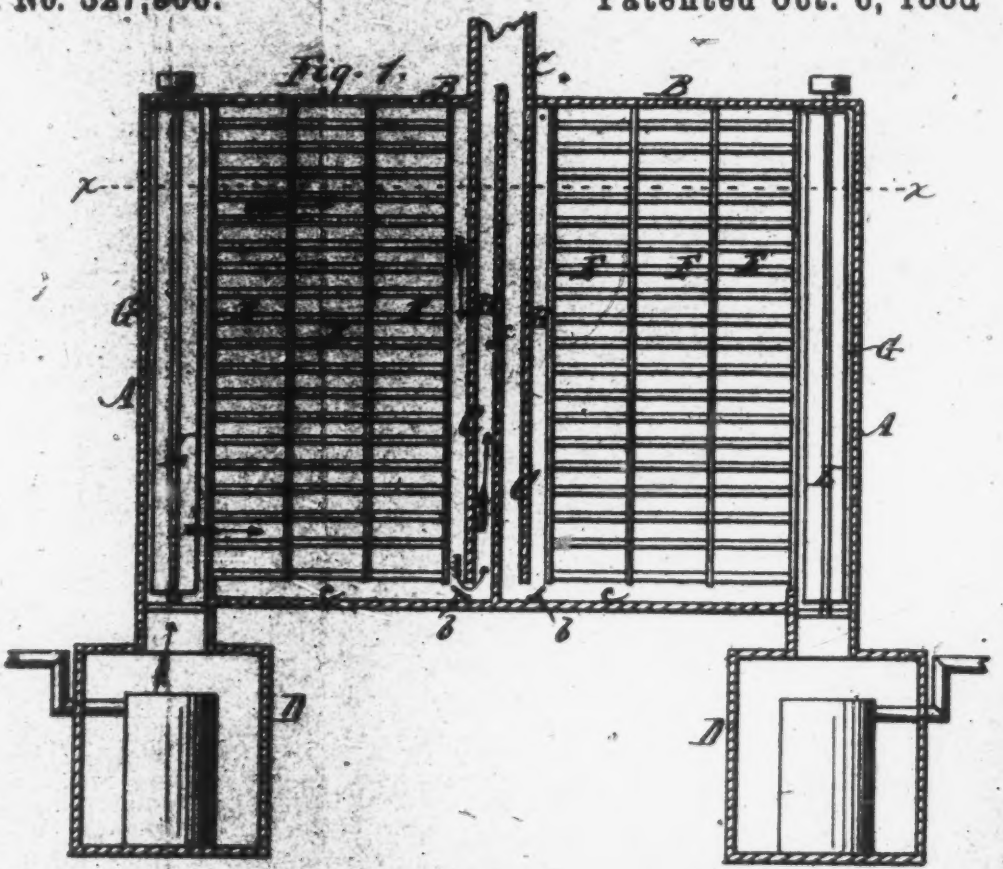
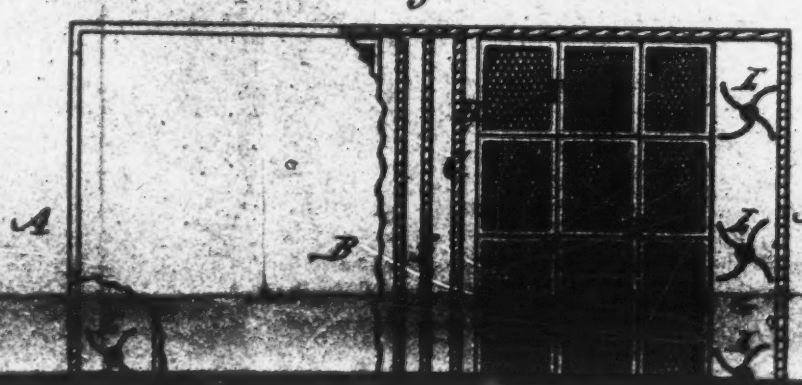


Fig. 2.



No. 327,900. Patented Oct. 6, 1885

Fig. 1.

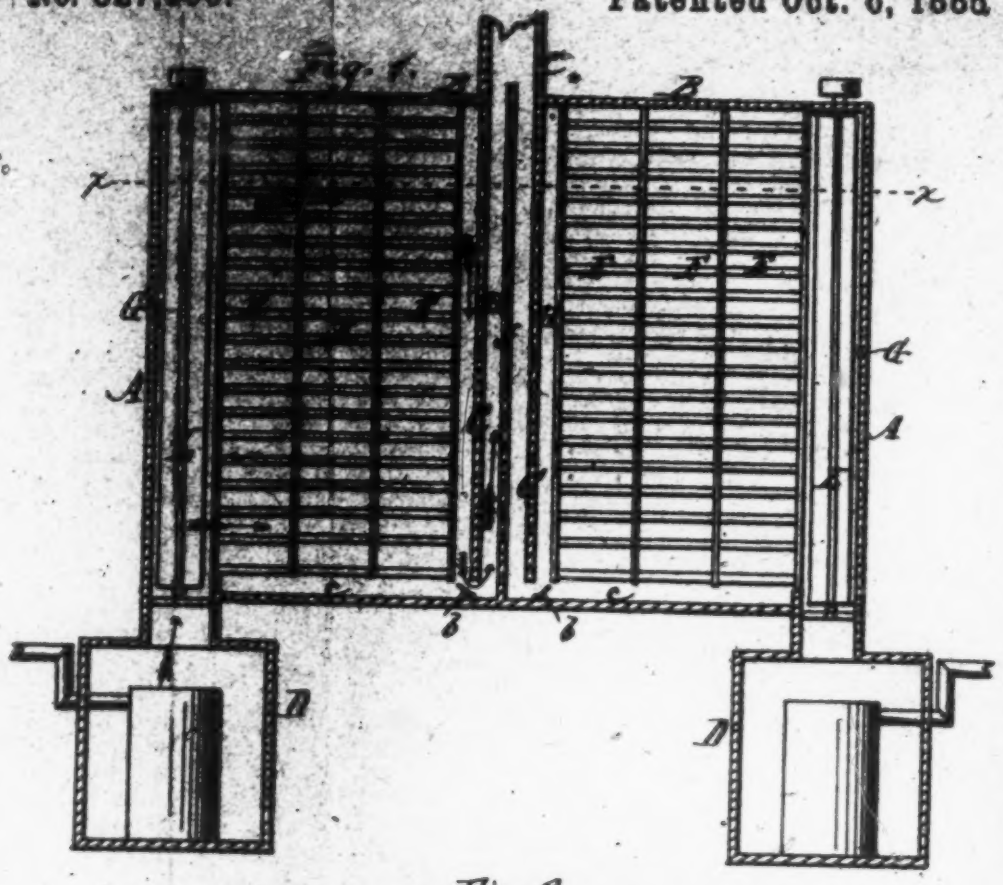
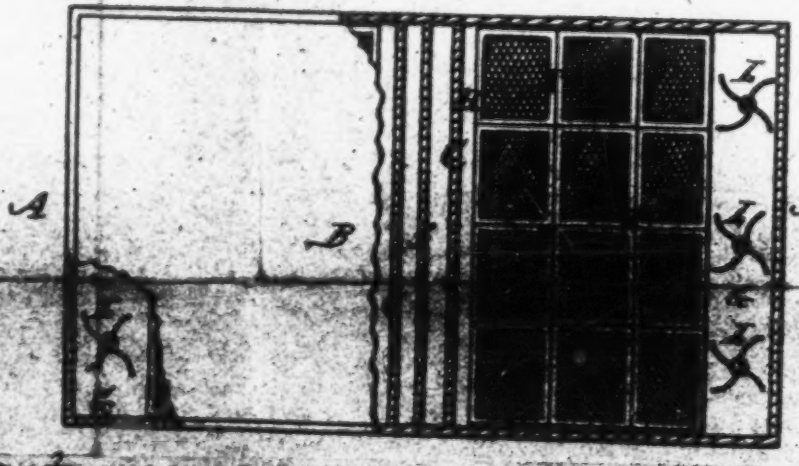


Fig. 2.



Attest.

E. N. Adams
Chas. H. Clark

Inventor.

Wm. H. Rogers,
per R. H. Osgood,
Atty.

UNITED STATES PATENT OFFICE.

WILLIAM H. ROGERS, OF WILLIAMSON, NEW YORK.

DRIER.

SPECIFICATION forming part of Letters Patent No. 237,900, dated October 6, 1885.

Application filed February 24, 1885. Serial No. 156,712. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. ROGERS, of Williamson, in the county of Wayne and State of New York, have invented a certain new and useful Improvement in Driers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of a drier showing my improvement. Fig. 2 is a horizontal section of the same in line *x x* of Fig. 1.

My improvement relates to driers for fruits, vegetables, and other uses, and is of that kind where the heated air is carried up vertically through flues on opposite sides of two drying-chambers, thence horizontally through and between the trays located in said drying-chambers, thence downward to the bottom of the drying-chambers, and thence upward through a central flue or exit-pipe, where it finally escapes, carrying the moisture off with it.

Heretofore in this class of driers the ability to pass off the moisture and perform the drying operation has depended on the natural draft of the heated air through the apparatus, which, owing to the want of power in the draft, and the indirect and circuitous passage through the apparatus has rendered the operation inoperative.

My invention consists in combining with such drying-chambers and flues, located in the [illegible] flue or blower located in the [illegible] flue, whereby an active current is produced through all parts of the [illegible] drying-chambers, the moisture readily escaping through the exit-flue, and the heated air is under control and can be used over and over again, if desired.

In the drawings, A A represent the walls of the drying-chambers, which may be of any suitable size and shape, and B B the doors thereof. C C are the trays, which are placed in the chambers in the usual manner, and may be of any suitable construction. D D are the flues, which extend up on opposite sides of the chambers, and E E are the flues which extend horizontally through and between the trays, and F F are the flues which extend downward from the chambers to the bottom of the drying-chambers, and G is the exit-flue, which extends upward from the bottom of the chambers through the roof of the building. The trays being placed at such a distance apart that sufficient space is left between the trays for the passage of the draft. In the drawings three sets of chambers are shown in each chamber. These trays are so arranged that a vertical flue-space, G, is left outside the trays, and a corresponding vertical flue-space, H, inside the trays, next to the escape-flue G. The bottom of flue G is open, but is provided with valves or dampers *h h*, by which it may be closed at any time. Beneath the trays in each chamber is a clear passage, *e*, which allows the passage of such vapor as collects there and has a tendency to remain at the bottom of the chamber. Such vapors will be carried off from the passages *e e* through the escape-flue.

f is a partition in the escape-flue G, the same extending up from the bottom of the case to a point above the top of the chamber, and dividing the escape flue into two distinct passages at the bottom, but uniting at the top, as shown.

I I are vertical fans or blowers, located in the outside flue-space, G, of each chamber. Two or more may be used in each flue-space. They extend the whole height of the chamber, covering all the trays, and are so fitted and so to impel the air forward to the exit-flue.

The heat from the furnace will rise by natural draft into the flue-space G. At this point the fans take and force it forward into the upper chambers, and thence downward into the exit-flue G, where it is finally escaped. By this means the heated air is under constant pressure in all parts of the chamber,

DRIER.

SPECIFICATION forming part of Letters Patent No. 337,900, dated [illegible].

Application filed February 21, 1885. Serial No. 156,715. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. ROGERS, of Williamson, in the county of Wayne and State of New York, have invented a certain new and useful Improvement in Driers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of a drier showing my improvement. Fig. 2 is a horizontal section of the same in line *x x* of Fig. 1.

My improvement relates to driers for fruits, vegetables, and other uses, and is of that kind where the heated air is carried up vertically through flues on opposite sides of two drying-chambers, thence horizontally through and between the trays located in said drying-chambers, thence downward to the bottom of the drying-chambers, and thence upward through a central flue or exit-pipe, where it finally escapes, carrying the moisture off with it.

Heretofore in this class of driers the ability to pass off the moisture and perform the drying operation has depended on the natural draft of the heated air through the apparatus, which, owing to the want of power in the draft, and the indirect and circuitous passage through the apparatus has rendered the operation ineffective.

My invention consists in combining with such an apparatus fans or blowers located in the vertical flues that receive the heat, and forcing the air forward under pressure, whereby an active current is produced through all parts of the apparatus, and the moisture removed, producing an effective drying action, all as hereinafter more fully described.

In the drawings, A shows a casing, which may be of any desired form and construction. B B are two drying-chambers in the opposite sides of the casing, and C is a central flue or exit-passage between the chambers for discharging the draft from both chambers.

D D are furnaces for producing the heat, one being used on each side; or, if desired, a single furnace may be used, supplying both sides. The apparatus may be heated by hot-air furnaces or steam heat.

E E E are sets of two or more sets of drying-trays, placed one above another in the two chambers, the trays being placed at such a distance apart that sufficient space is left between the trays for the passage of the draft. In the drawings three sets of chambers are shown in each chamber. These trays are so arranged that a vertical flue-space, G, is left outside the trays, and a corresponding vertical flue-space, H, inside the trays, next to the escape-flue C. The bottom of flue C is open, but is provided with valves or dampers *b b*, by which it may be closed at any time. Beneath the trays in each chamber is a clear passage, *c*, which allows the passage of such vapor as collects there and has a tendency to remain at the bottom of the chambers. Such vapors will be carried off from the passages *c c* through the escape-flue.

f is a partition in the escape-flue C, the same extending up from the bottom of the case to a point above the top of the chamber, and dividing the center flue into two distinct passages at the bottom, but uniting at the top, as shown.

L L are vertical fans or blowers, located in the outside flue-space, G, of each chamber. Two or more may be used in each flue-space. They extend the whole height of the chamber, covering all the trays, and are so feathered as to impel the air forward to the exit-flue.

The heat from the furnace will rise by natural draft into the flue-space G. At this point the fans take and force it forward horizontally through and between the trays into the inner flue-space, H, and thence downward into the exit-flue C, when it finally escapes. By this means the heated air is under constant pressure at all parts of the chamber, and exerts a regular and uniform draft through all the trays from bottom to top, and effectually carries off all the moisture. It obviates the difficulties heretofore experienced in the passing of the heat through the apparatus, which has solely been done, so far as I know, simply by the natural draft, and this is not sufficient to establish proper circulation to do drying. By using the fans or blowers at the sides of the chambers, and producing a positive blast through, the proper circulation is established and maintained.

This apparatus is specially adapted to drying fruits and vegetables, but may be used for

drying other materials, and I do not wish to restrict myself to any particular use.

If desired, other articles or materials than trays may be placed in the chambers for drying, it only being necessary to leave horizontal spaces between for the passage of the draft.

If desired, a blower may be used for increasing the draft in the exit-flue above the chambers; but it is not necessary under ordinary circumstances.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a drier, the combination of a chamber in which the material to be dried is placed, a furnace for supplying the heat to do the drying, a flue-space in the outer side of the chamber, fans or blowers located in this flue-space for driving the heat inward through the material to be dried, a flue-space in the inner side of the chamber for conducting the heat downward, and an exit-flue for receiving the heat and vapor at the bottom and conducting it off, as set forth.

2. In a drier, the combination of two drying-chambers, a central escape-flue common to both, flue-spaces in the outer and inner sides of both chambers, and fans or blowers located in the outer flue-spaces for forcing the air through horizontally to the exit-pipe, as herein shown and described.

3. In a drier, the combination of two drying-chambers, a central escape-flue common to both and provided with a central partition that extends above the chambers, flue-spaces in the outer and inner sides of both chambers, fans or blowers located in the outer flue-spaces for forcing the air through horizontally to the exit-pipe, and spaces for the vapors at the bottom of the chambers, as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

W. H. ROGERS.

Witnesses:
LEWIS H. ROBIE,
CHARLES H. ROBIE.

1037

No. 891,018. PATENTED JUNE 16, 1908.

L. VERNA.

DRYING ROOM.

APPLICATION FILED OCT. 22, 1907.

2 SHEETS—SHEET 1.

FIG. 1.

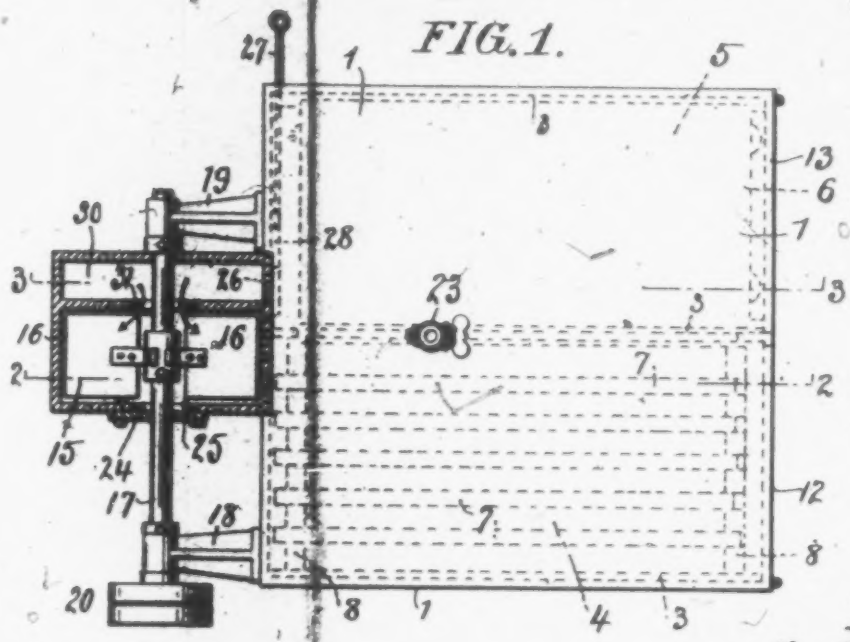


FIG. 6.

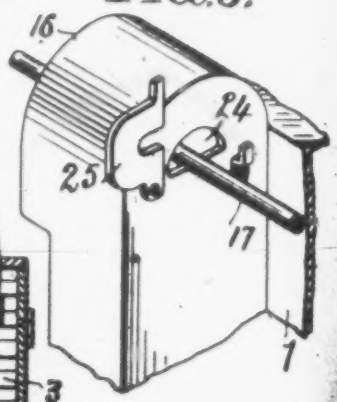
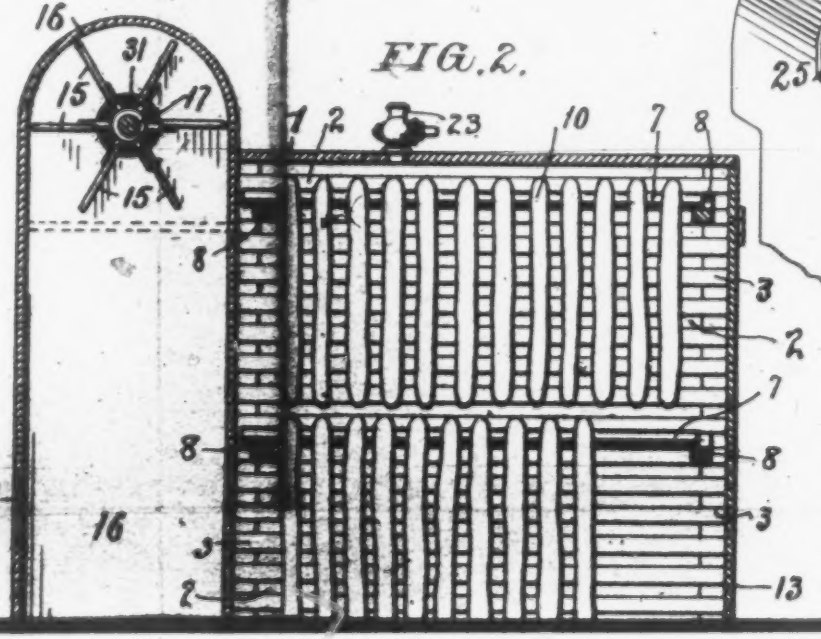


FIG. 2.



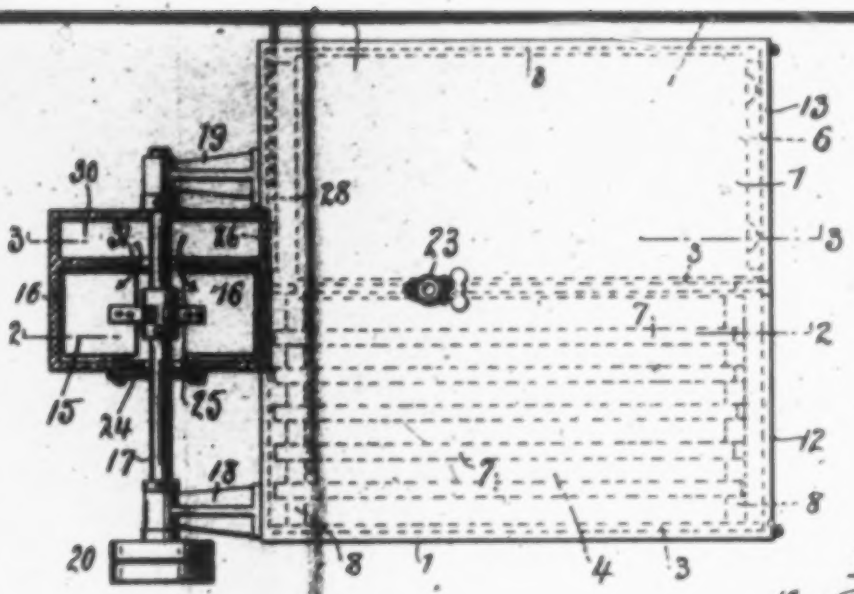


FIG. 6.

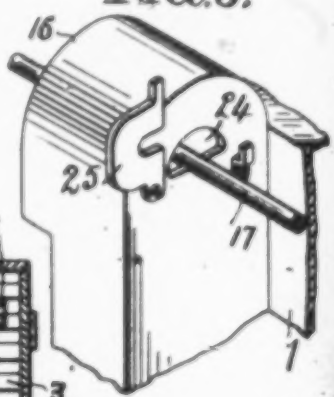
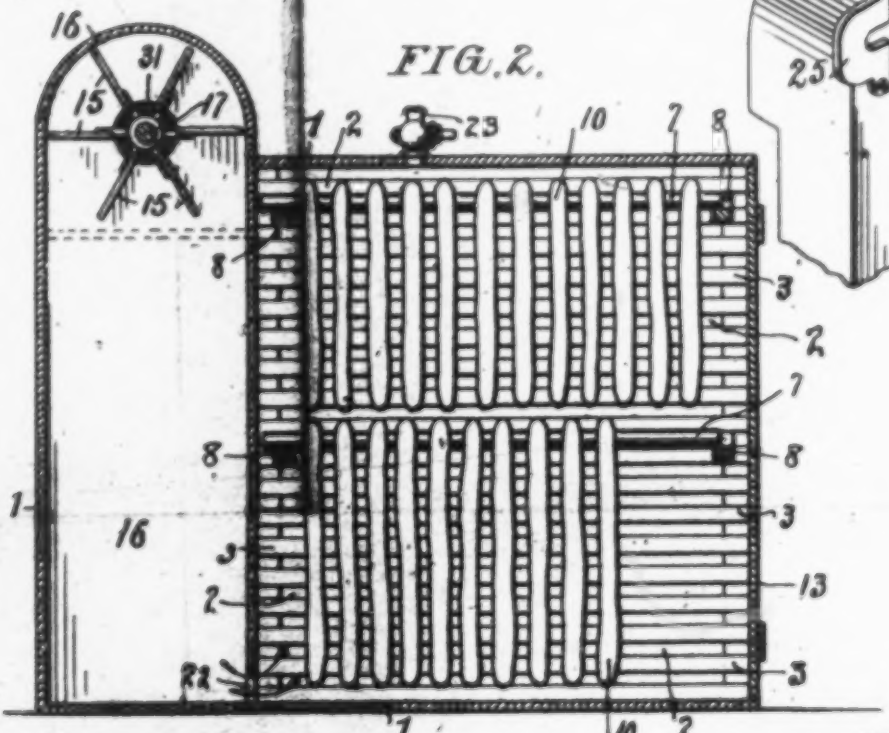


FIG. 2.



Witnesses:
M. Rodeland
Hughmebaney, Jr

Inventor:
Luigi Verna
By his Attorney
F. Dilitt Goodwin

1038

No. 891,010. PATENTED JUNE 16, 1908.

L. VERNA.

DRYING ROOM.

APPLICATION FILED OCT. 22, 1907.

2 SHEETS—SHEET 2.

FIG. 3.

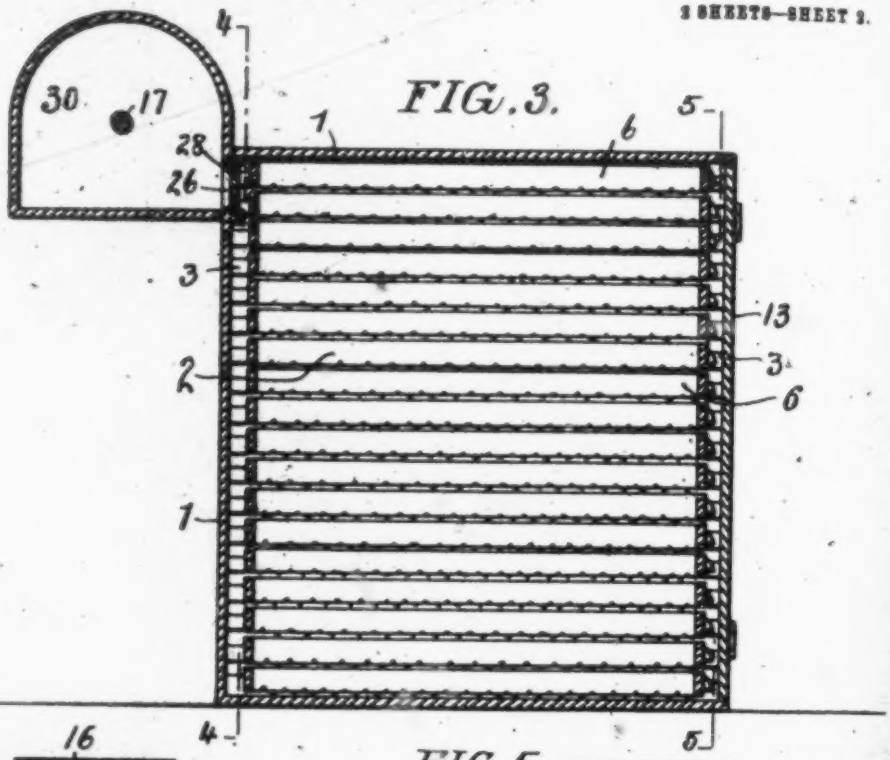


FIG. 4.

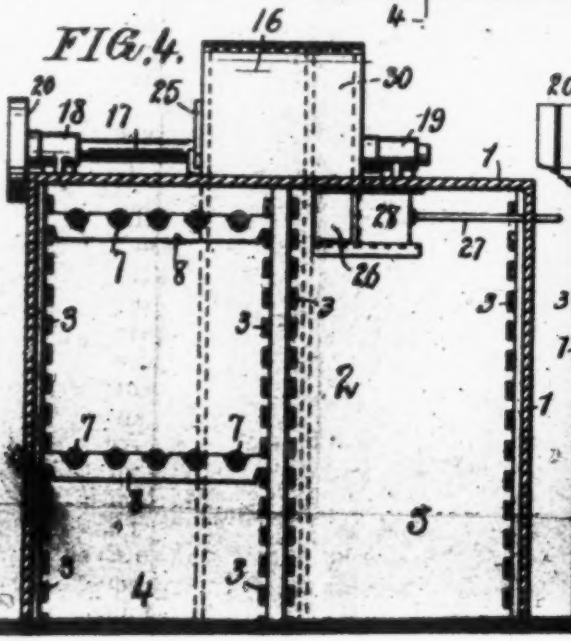


FIG. 5.

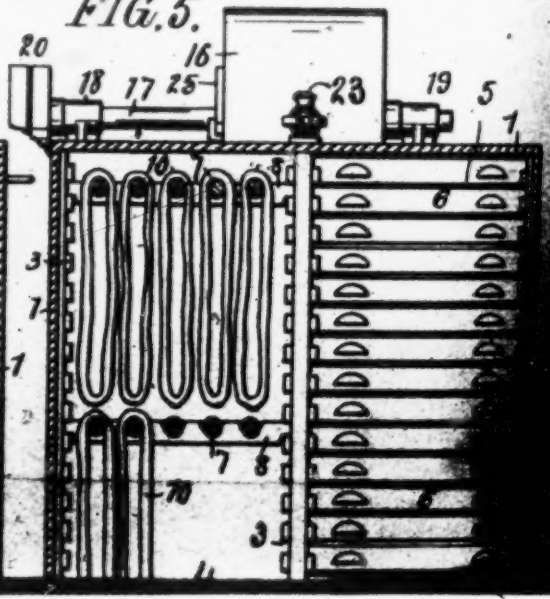


FIG. 3.

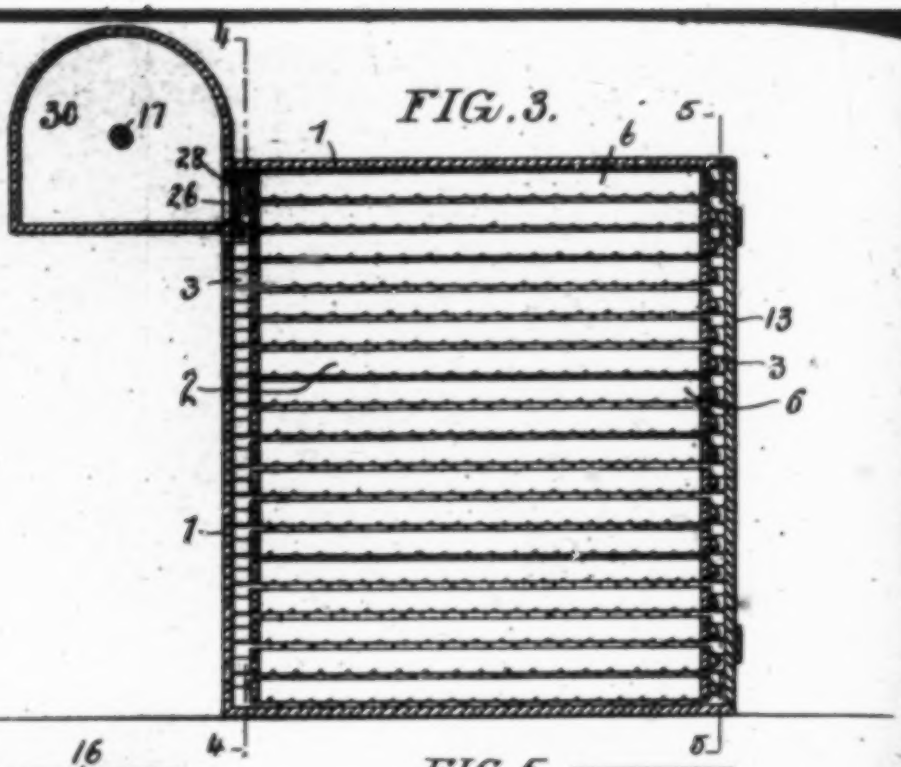


FIG. 4.

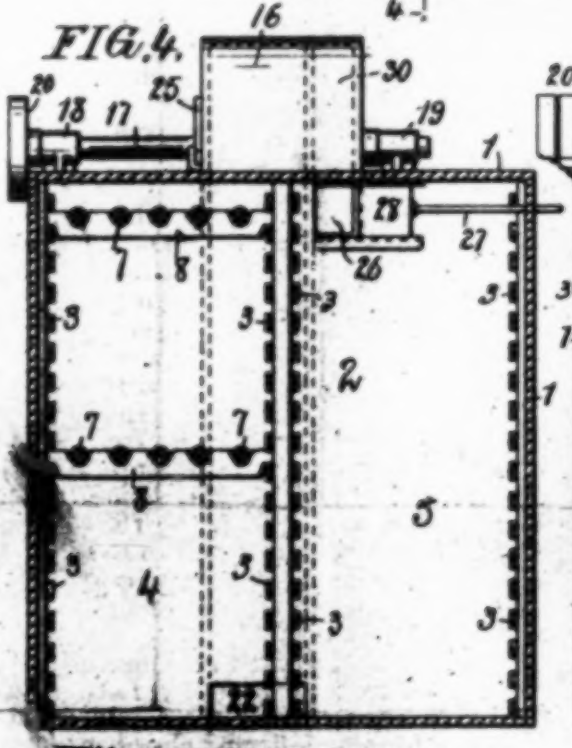
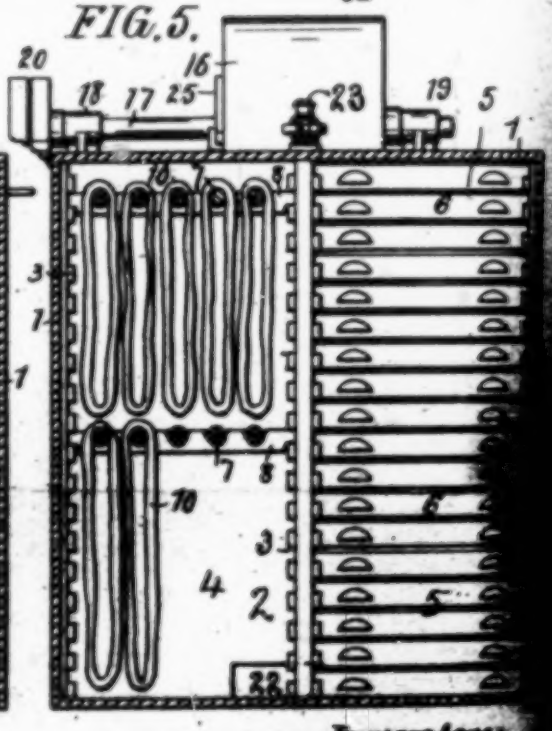


FIG. 5.



Witnesses:
H. W. Schuland
Stephen Bonney, Jr.

Inventor:
Luigi Verna
By his Attorney
F. Allett Goodwin

UNITED STATES PATENT OFFICE.

LUIGI VERNA, OF PHILADELPHIA, PENNSYLVANIA.

DRYING-ROOM.

No. 891,019. Specification of Letters Patent. Patented June 16, 1908.

Application filed October 22, 1907. Serial No. 398,611.

To all whom it may concern:

Be it known that I, LUIGI VERNA, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Drying-Rooms, of which the following is a specification.

My invention relates to improvements in a drying machine and particularly relates to a machine for drying alimentary paste or dough used in the manufacture of macaroni.

The object of my invention is to construct a drying machine in which the dough can be quickly dried without causing the surface or crust of the dough to crack, this I accomplish by constructing the drying machine so that the dough may be subjected to an atmospheric pressure which will dry the dough uniformly without causing the surface to crack; a further object of my invention is to provide means for causing the air in the drying machine to circulate and also for admitting fresh air to the same when desired; these together with other novel features of construction of the parts of the machine, which will be more fully hereinafter described, constitute my invention.

Referring to the drawings: Figure 1. is a plan view of my improved drying machine showing the fan box in section; Fig. 2. is a vertical section on line 2—2 Fig. 1; Fig. 3. is a vertical section on line 3—3 Fig. 1; Fig. 4. is a vertical section on line 4—4 Fig. 3; Fig. 5. is a vertical section on line 5—5 Fig. 3; and, Fig. 6. is a perspective view of the fan box.

In the drawings 1 represents a casing forming the drying chamber 2, said casing 1 is preferably rectangular in form and is provided with racks 3 which divide the drying chamber into different compartments 4 and 5 into which compartments may either be [illegible] said cross-pieces 8 are removable, so that either the drawers 6 or the poles 7 may be used in any of the compartments as desired.

The drying machine is provided with large doors 12 and 13, so as to make the interior of the drying chamber accessible.

The drying machine is provided with a fan 15, mounted in a fan box 16. A shaft 17, supported in bearings 18 and 19, carries the said fan and is driven by the belt wheels 20, or any other suitable means.

The fan box 16 extends to the bottom of the drying machine, where the air from the fan passes through the aperture 22 into the drying chamber, which is practically air tight, so that the air will be held under a sufficient pressure to uniformly dry the dough contained in the drawers or suspended upon the poles.

A stop-cock 23 is provided at the top of the drying machine, which may be opened to reduce the air pressure in the drying chamber when desired.

The fan box is provided with a centrally located opening 24 having an adjustable cover 25, as shown in Fig. 6; which may be opened to admit fresh air to the fan.

When it is desired to cause the air in the drying chamber to circulate, the aperture 26, formed at the top of the drying chamber, as shown in Figs. 3 and 4, is opened by means of the rod 27, which is connected with a sliding door 28, adapted to tightly close said aperture 26. When said aperture 26 is opened the air will be drawn from the top of the drying chamber into the return chamber 30, from which it is drawn, through the opening 31, into the fan box 16. The cover 25, of the fan box may be closed so that the air in the drying chamber will circulate, or the cover may be opened to admit fresh air as desired.

Having thus [illegible]

No. 891,019. Specification of Letters Patent. Patented June 16, 1908.

Application filed October 23, 1907. Serial No. 398,611.

To all whom it may concern:

Be it known that I, LUIGI VERNA, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Drying-Rooms, of which the following is a specification.

My invention relates to improvements in a drying machine and particularly relates to a machine for drying alimentary paste or dough used in the manufacture of macaroni.

The object of my invention is to construct a drying machine in which the dough can be quickly dried without causing the surface or crust of the dough to crack, this I accomplish by constructing the drying machine so that the dough may be subjected to an atmospheric pressure which will dry the dough uniformly without causing the surface to crack; a further object of my invention is to provide means for causing the air in the drying machine to circulate and also for admitting fresh air to the same when desired; these together with other novel features of construction of the parts of the machine, which will be more fully hereinafter described, constitute my invention.

Referring to the drawings: Figure 1. is a plan view of my improved drying machine showing the fan box in section; Fig. 2. is a vertical section on line 2—2 Fig. 1; Fig. 3. is a vertical section on line 3—3 Fig. 1; Fig. 4. is a vertical section on line 4—4 Fig. 3; Fig. 5. is a vertical section on line 5—5 Fig. 3; and, Fig. 6. is a perspective view of the fan box.

In the drawings 1 represents a casing forming the drying chamber 2, said casing 1 is preferably rectangular in form and is provided with racks 3 which divide the drying chamber into different compartments 4 and 5 into which compartments may either be placed the drawers 6, or poles 7, supported upon racks or guides 8, provided for that purpose. The drawers have bottoms formed of wire mesh, upon which is placed the short pieces of dough. The dough is also dried in long coils, such as shown at 10. These coils of dough are hung upon the poles 7, which are suspended between the said cross-pieces 8, which in turn rest upon the racks 3. The said cross-pieces 8 are removable, so that either the drawers 6 or the poles 7 may be used in any of the compartments as desired.

The drying machine is provided with large doors 12 and 13, so as to make the interior of the drying chamber accessible.

The drying machine is provided with a fan 15, mounted in a fan box 16. A shaft 17, supported in bearings 18 and 19, carries the said fan and is driven by the belt wheels 20, or any other suitable means.

The fan box 16 extends to the bottom of the drying machine, where the air from the fan passes through the aperture 22 into the drying chamber, which is practically air tight, so that the air will be held under a sufficient pressure to uniformly dry the dough contained in the drawers or suspended upon the poles.

A stop-cock 23 is provided at the top of the drying machine, which may be opened to reduce the air pressure in the drying chamber when desired.

The fan box is provided with a centrally located opening 24 having an adjustable cover 25, as shown in Fig. 6; which may be opened to admit fresh air to the fan.

When it is desired to cause the air in the drying chamber to circulate, the aperture 26, formed at the top of the drying chamber, as shown in Figs. 3 and 4, is opened by means of the rod 27, which is connected with a sliding door 28, adapted to tightly close said aperture 26. When said aperture 26 is opened the air will be drawn from the top of the drying chamber into the return chamber 30, from which it is drawn, through the opening 31, into the fan box 16. The cover 25, of the fan box may be closed so that the air in the drying chamber will circulate, or the cover may be opened to admit fresh air as desired.

Having thus described my invention I claim and desire to secure by Letters Patent:

In a drying room, the combination of a casing forming a drying chamber, a fan box located adjacent said drying chamber and having an aperture formed therein for admitting air to the lower portion of said drying chamber, a fan in said fan box, said drying chamber having an aperture formed in the

upper portion thereof, a return chamber communicating with said aperture in the upper portion of said drying chamber and with said fan box, means for closing said last mentioned aperture, racks formed in said drying chamber and means supported upon said racks for carrying the articles to be dried.

In testimony whereof I affix my signature in presence of two witnesses.

LUIGI VERNA.

Witnesses:
JOSEPH B. LANNING,
J. F. G. ATTLIN.

1041

M. E. BRADLEY.

STOREHOUSE FOR VEGETABLES.

APPLICATION FILED SEPT. 19, 1908.

934,274. Patented Sept. 14, 1909.

2 SHEETS—SHEET 1.

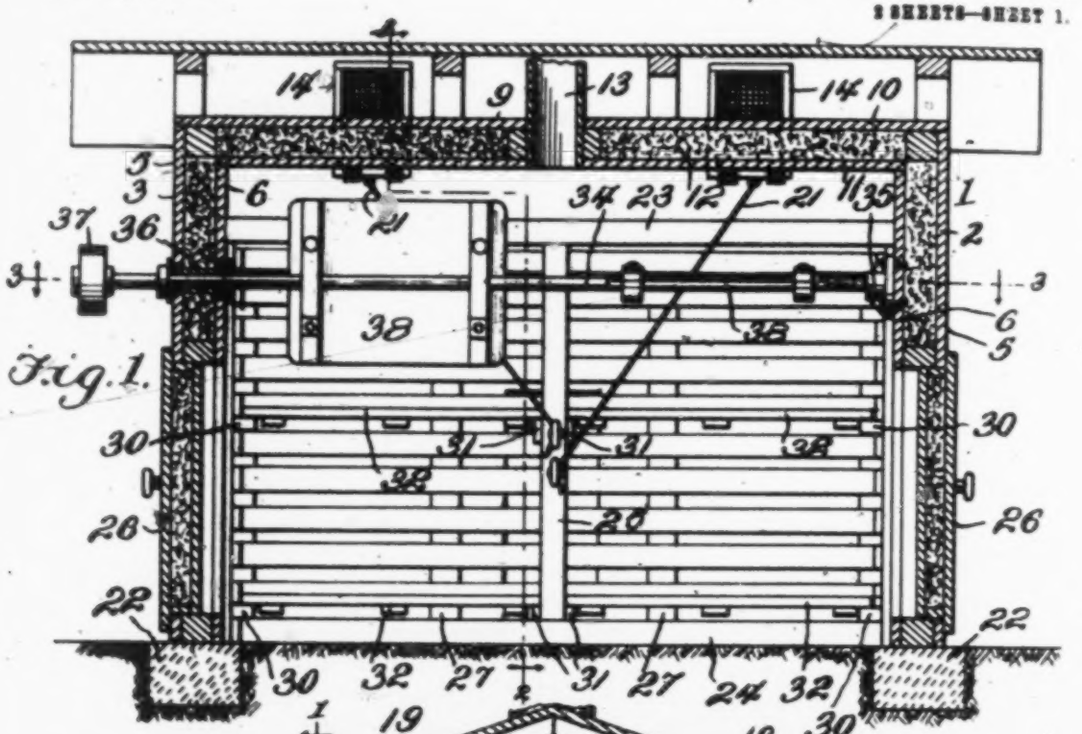


Fig. 1.

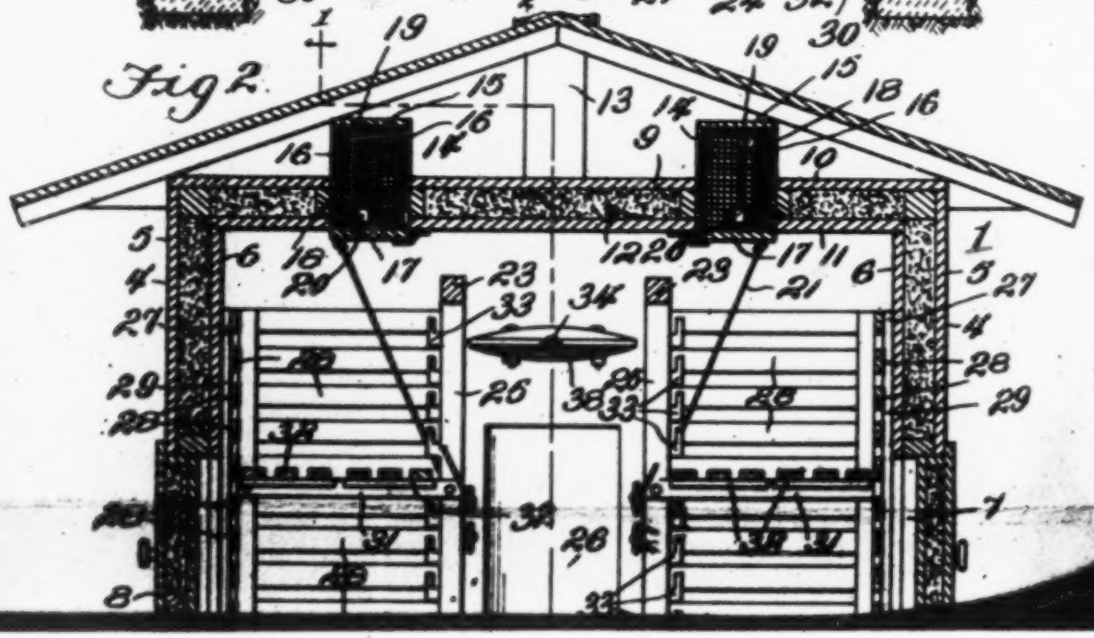


Fig 2.

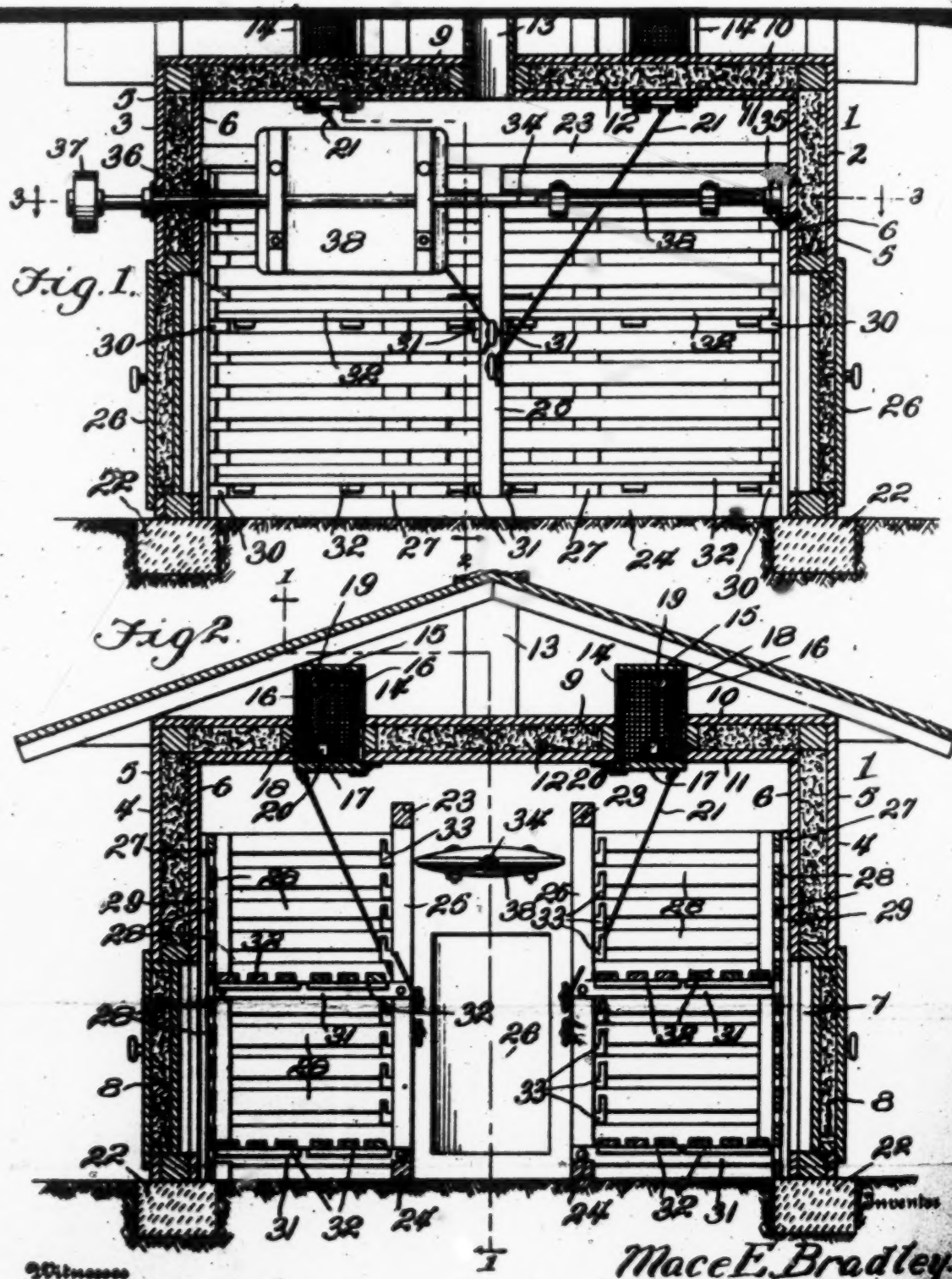


Fig. 1.
Fig 2.
Witnesses
J. F. L. Wright.
Inventor
Mace E. Bradley.
By Victor J. Evans
Attorney

1042

M. E. BRADLEY.

STOREHOUSE FOR VEGETABLES.

APPLICATION FILED SEPT. 19, 1908.

934,274. Patented Sept. 14, 1909.

2 SHEETS—SHEET 1.

Fig. 3.

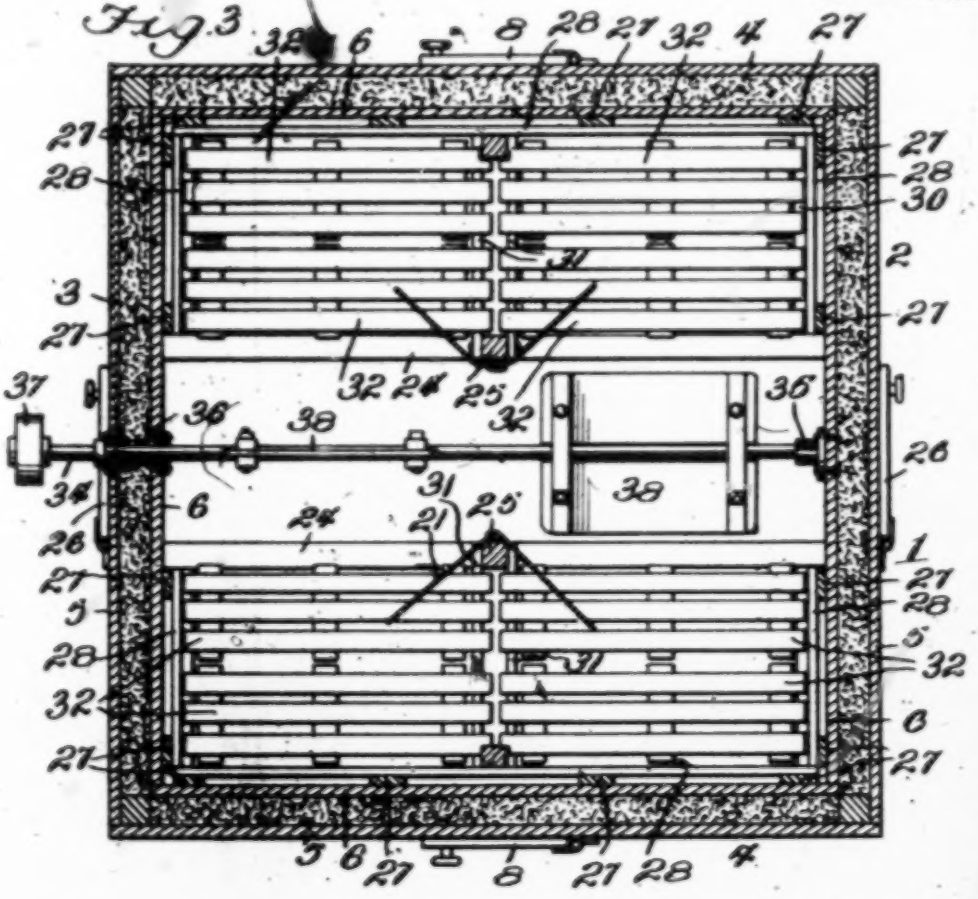
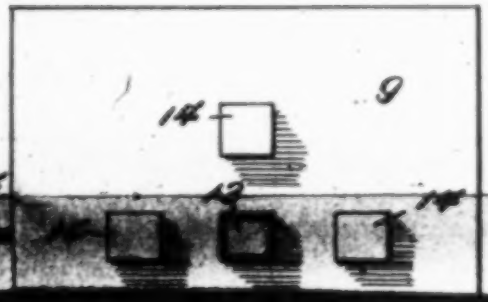


Fig. 4.



934,274.

Patented Sept. 14, 1909.

3 SHEETS—SHEET 2.

Fig. 3

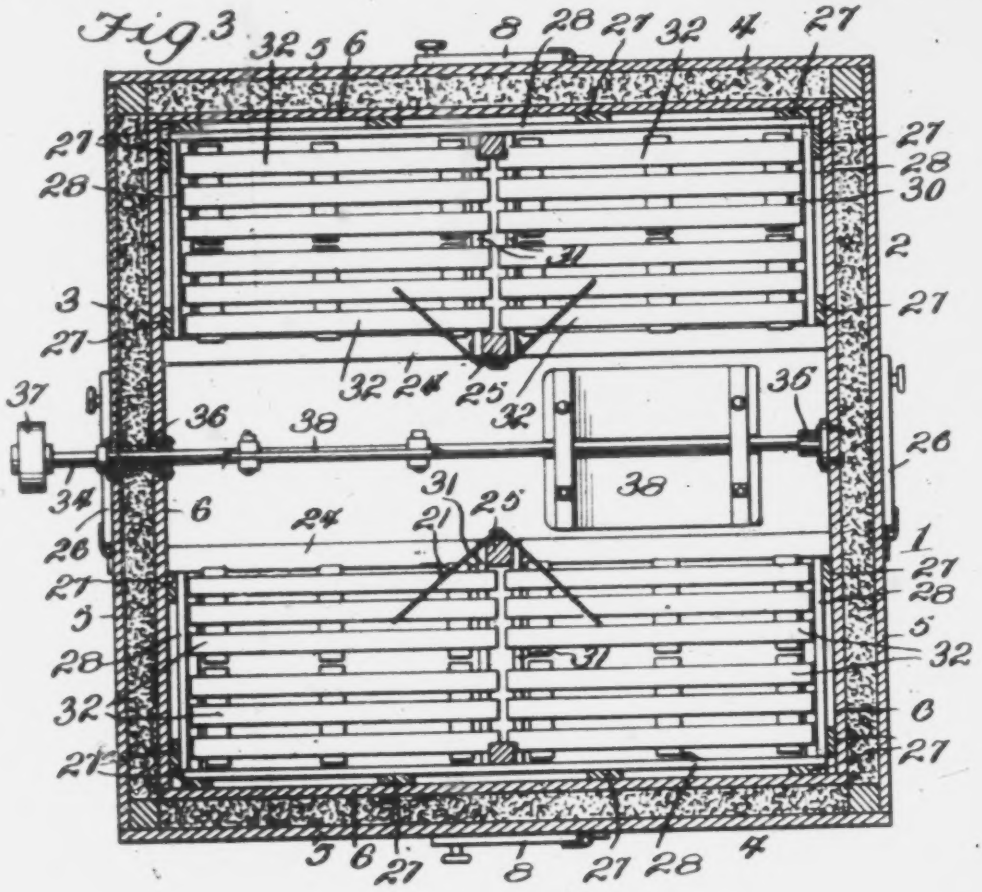
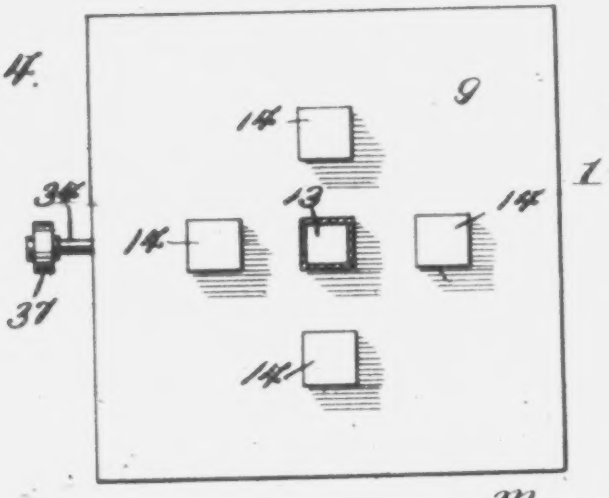


Fig. 4.



Witnesses
J. L. Wright
Jon. A. Wiebel

Inventor
Mace E. Bradley
By Victor J. Evans
Attorney

UNITED STATES PATENT OFFICE.

MACE E. BRADLEY, OF BOONEVILLE, ARKANSAS.

STOREHOUSE FOR VEGETABLES.

934,274. Specification of Letters Patent. Patented Sept. 14, 1909.

Application filed September 19, 1908. Serial No. 453,754.

To all whom it may concern:

Be it known that I, MACE E. BRADLEY, a citizen of the United States, residing at Booneville, in the county of Logan and State of Arkansas, have invented new and useful Improvements in Storehouses for Vegetables, of which the following is a specification.

This invention relates to the class of preserving and more particularly to store houses for vegetables, and has for an object to provide a house of this character especially adapted for storing potatoes and to provide effective means to effect an artificial circulation of air to absorb the moisture from the potatoes or vegetables.

A further object of this invention is to provide simple forms of bins for retaining the potatoes at convenient points in the house, and to provide novel forms of ventilators.

Other objects and advantages will be apparent as the nature of the invention is better disclosed, and it will be understood that changes within the scope of the claim may be resorted to without departing from the spirit of the invention.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a vertical section through the house, Fig. 2 is a view taken on the line 2—2 of Fig. 1, Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 1, Fig. 4 is a top plan view.

Referring now more particularly to the drawings, there is shown a store house 1 which preferably consists of a front wall 2, a rear wall 3, and side walls 4. The said walls are each formed from an outer section 5 and an inner section 6, and as clearly shown upon reference to the drawings, sawdust or other insulating material is placed [illegible] forming the said walls. with a top 15, foraminous walls 16, and a hinged door 17. The doors 17 have connected thereto ends of cords or similar flexible elements 18 which are passed over pulleys 19, and the free ends of the said cords or elements are provided with weights 20 adapted to hold the said door 17 in closed position. Suitable operating cords or the like 21 are connected to the doors 17 and their free ends are connected in a suitable manner to cleats or the like which may be arranged or located at suitable points in the house. It will be seen that upon operating the cords 21 the doors 17 of the ventilators may be conveniently opened to allow the desired quantity of air to enter the house as is obvious. The lower ends of the walls are preferably mounted upon a concrete or stone foundation as indicated at 22.

Spaced beams 23 are located adjacent to the top or floor 9 and these beams are connected at their ends to the walls 2 and 3. Similar beams 24 are located at the lower end of the house and are connected at their ends to the walls 2 and 3, and the said beams 23 are connected by vertical uprights 25. The construction is such that the space between the beams forms an aisle, and at each end of the said aisle a door 26 is provided which may be used as entrance and exit doors as will be readily understood. Each wall is provided upon its inner face with a series of vertically disposed slats or like elements 27, and a plurality of horizontally disposed slats 28 are secured to the said slats 27, and are disposed in spaced relation to each other as clearly shown in Fig. 2 of the drawings. The construction of the slats 27 and 28 is such that air chambers 29 are formed between the walls of the house and the said slats 28 and thus effects a thorough ventilation. A series of cleats 30 are secured to the walls 2 and 3, upon their inner faces and

To all whom it may concern:

Be it known that I, MACE E. BRADLEY, a citizen of the United States, residing at Booneville, in the county of Logan and State of Arkansas, have invented new and useful Improvements in Storehouses for Vegetables, of which the following is a specification.

This invention relates to the class of preserving and more particularly to store houses for vegetables, and has for an object to provide a house of this character especially adapted for storing potatoes and to provide effective means to effect an artificial circulation of air to absorb the moisture from the potatoes or vegetables.

A further object of this invention is to provide simple forms of bins for retaining the potatoes at convenient points in the house, and to provide novel forms of ventilators.

Other objects and advantages will be apparent as the nature of the invention is better disclosed, and it will be understood that changes within the scope of the claim may be resorted to without departing from the spirit of the invention.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a vertical section through the house, Fig. 2 is a view taken on the line 2—2 of Fig. 1, Fig. 3 is a horizontal section taken on the line 3—3 of Fig. 1, Fig. 4 is a top plan view.

Referring now more particularly to the drawings, there is shown a store house 1 which preferably consists of a front wall 2, a rear wall 3, and side walls 4. The said walls are each formed from an outer section 5 and an inner section 6, and as clearly shown upon reference to the drawings, sawdust or other insulating material is placed between the sections forming the said walls. The walls 4 are each provided with a door opening 7 and a door 8, the doors being constructed in the manner identical to the construction of the walls of the house. A top or floor 9 is provided and consists of spaced members 10 and 11 between which is shown sawdust or the like 12. The top or floor 9 is provided with a centrally located flue 13 which opens into the house as clearly shown in Fig. 1 of the drawings, and the said top or floor is provided with a plurality of ventilators 14 which are preferably of rectangular form and are each provided with a top 15, foraminous walls 16, and a hinged door 17. The doors 17 have connected thereto ends of cords or similar flexible elements 18 which are passed over pulleys 19, and the free ends of the said cords or elements are provided with weights 20 adapted to hold the said door 17 in closed position. Suitable operating cords or the like 21 are connected to the doors 17 and their free ends are connected in a suitable manner to cleats or the like which may be arranged or located at suitable points in the house. It will be seen that upon operating the cords 21 the doors 17 of the ventilators may be conveniently opened to allow the desired quantity of air to enter the house as is obvious. The lower ends of the walls are preferably mounted upon a concrete or stone foundation as indicated at 22.

Spaced beams 23 are located adjacent to the top or floor 9 and these beams are connected at their ends to the walls 2 and 3. Similar beams 24 are located at the lower end of the house and are connected at their ends to the walls 2 and 3, and the said beams 23 are connected by vertical uprights 25. The construction is such that the space between the beams forms an aisle, and at each end of the said aisle a door 26 is provided which may be used as entrance and exit doors as will be readily understood. Each wall is provided upon its inner face with a series of vertically disposed slats or like elements 27, and a plurality of horizontally disposed slats 28 are secured to the said slats 27, and are disposed in spaced relation to each other as clearly shown in Fig. 2 of the drawings. The construction of the slats 27 and 28 is such that air chambers 29 are formed between the walls of the house and the said slats 28 and thus effects a thorough ventilation. A series of cleats 30 are secured to the walls 2 and 3, upon their inner faces, and similar cleats 31 are secured to the uprights 25 and to the walls 4 of the house as will be seen upon reference to Figs. 1 and 2 of the drawings, and these cleats are thus adapted to support a plurality of slatted platforms 32. It will be seen that by providing the slatted platforms 32 and arranging the same in the manner shown a plurality of compartments or bins are provided for the reception of potatoes or vegetables to be treated, and access may be had to the said compartments or bins from the aisle previously described and to prevent the contents of the

bins from falling into the aisle I provide a plurality of elements 33 adapted to receive slats or the like as will be clearly understood.

Beneath the top or floor 9 of the house, and disposed between the uprights 25 is shown a horizontal shaft 34 having one of its ends journaled in a bearing 35 upon the wall 2, and the other end of the said shaft is extended through a bushing 36 carried by the wall 3, and carries a driven pulley 37 which may receive its power by means of any suitable motor. The shaft is provided with a plurality of fan blades 38 arranged or disposed in a manner to deliver air current into the bins or compartments previously described.

In operation, potatoes or vegetables to be treated are placed in the bins, and the doors 17 of the ventilators are opened to the desired extent to permit a fresh supply of air. After the doors of the house have been securely closed, the shaft 34 is driven in the manner previously described, and by means of the fan blades 38 upon the shaft, air currents will be effectively discharged throughout the interior of the house and moisture from the potatoes will be effectively evaporated.

A gable roof 19ª is provided and is located directly above the ventilators 14 to protect the same and which has its outer edges extending beyond the upper ends of the vertical walls forming the house but in spaced relation thereto so that the proper amount of natural air can be conveyed to the ventilators.

Having thus described the invention, what is claimed as new, is:—

In a preserving house of the class specified, an inclosure having a plurality of bins disposed therein and arranged with respect to each other to form a centrally located aisle, said inclosure having doors at the ends of the aisle, said inclosure having a top portion provided with a series of ventilators formed of foraminous material and having their upper portions extended above the top of the housing, doors adapted to normally close the lower ends of the ventilators, operating cords connected with the doors and extending into the said aisle, a gable roof carried by the inclosure and having portions adjacent to its outer edges disposed in spaced relation to the top of the inclosure, a centrally located flue extending from the roof into the inclosure, and a longitudinally extending fan shaft revolubly connected at its ends with the walls of the inclosure at the ends of the said aisle.

In testimony whereof I affix my signature in presence of two witnesses.

MACE E. BRADLEY.

Witnesses:
JOHN H. WHITE,
W. A. RATTENER.

1045

J. SCHMIDT & H. SCHÜTTERLE.

APPARATUS FOR DRYING MACARONI AND LIKE BAKERY PRODUCTS.

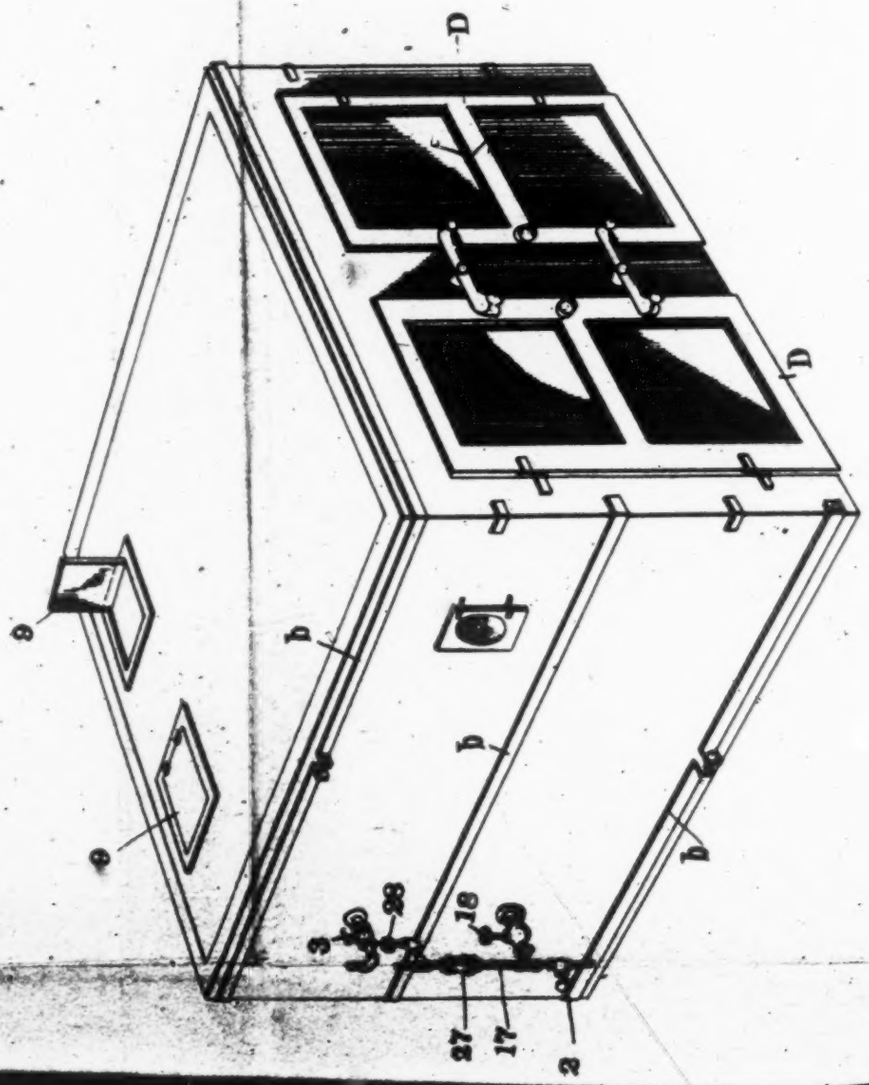
APPLICATION FILED JUNE 9, 1911.

1,010,809.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 1.

Fig. 1



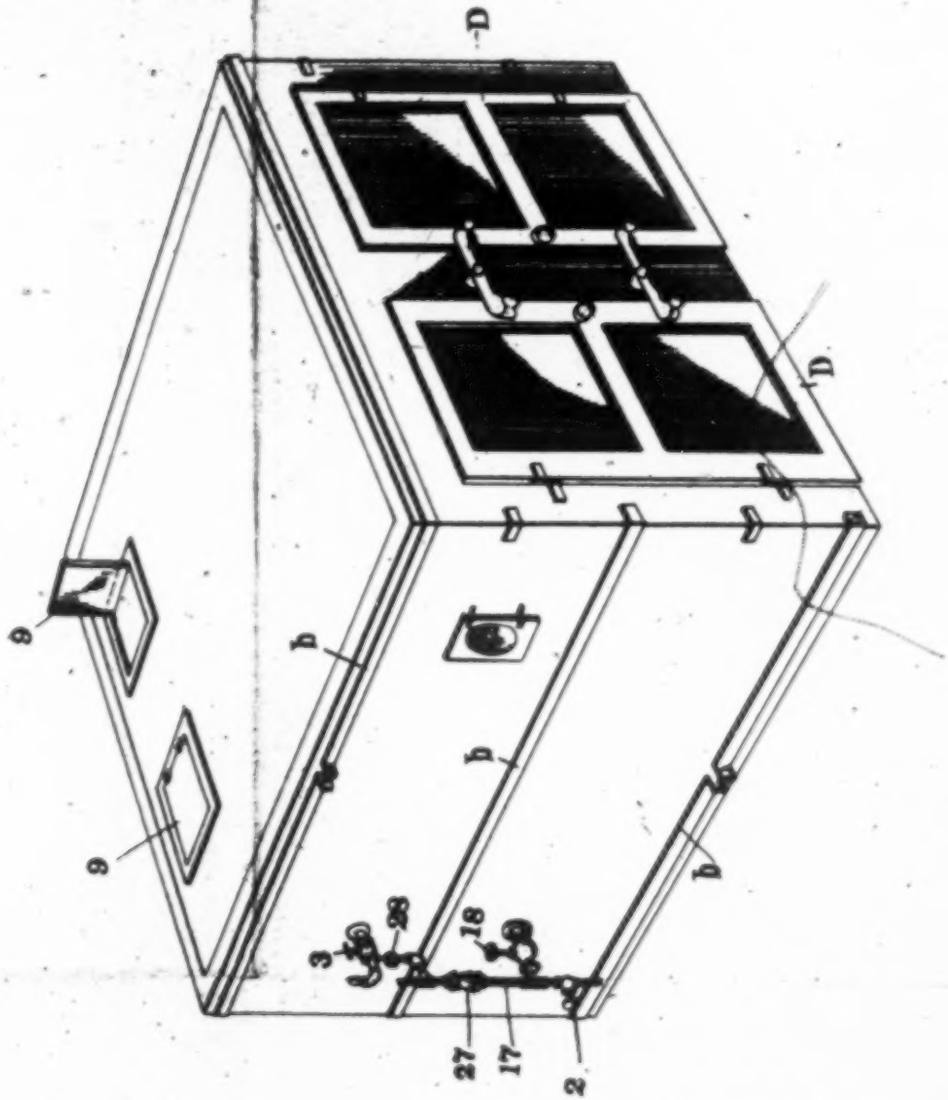


Fig 1

ATTEST

E. M. Gilbert

J. C. Mueseum.

INVENTORS.

JOHN SCHMIDT

HENRY SCHÜTTERLE.

BY Fisher Williams ATTYS.

1046

J. SCHMIDT & H. SCHÜTTERLE.

APPARATUS FOR DRYING MACARONI AND LIKE BAKERY PRODUCTS.

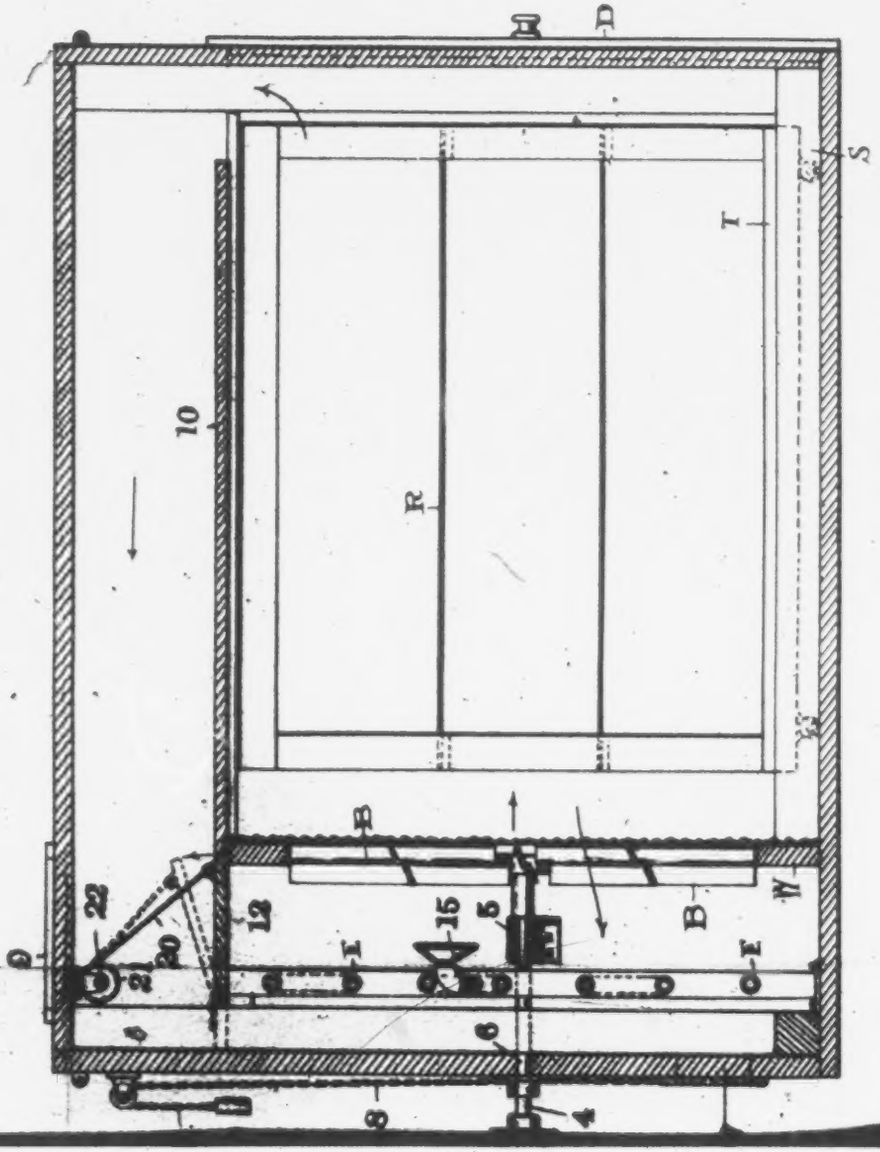
APPLICATION FILED JUNE 9, 1911.

1,010,809.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 2

Fig. 2



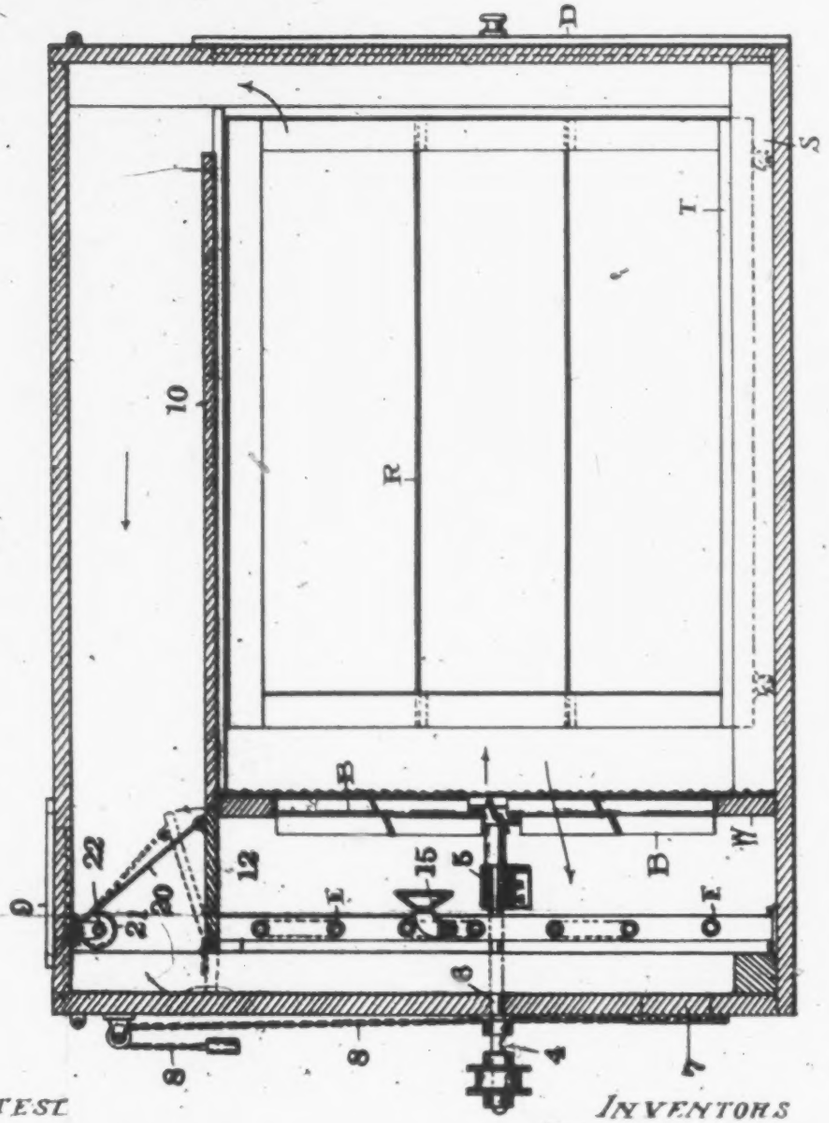


Fig. 2

ATTEST

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H. C. Musaum

INVENTORS

JOHN SCHMIDT

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1047

J. SCHMIDT & H. SCHÜTTERLE.

APPARATUS FOR DRYING MACARONI AND LIKE BAKERY PRODUCTS.

APPLICATION FILED JUNE 9, 1911.

1,010,809.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 3

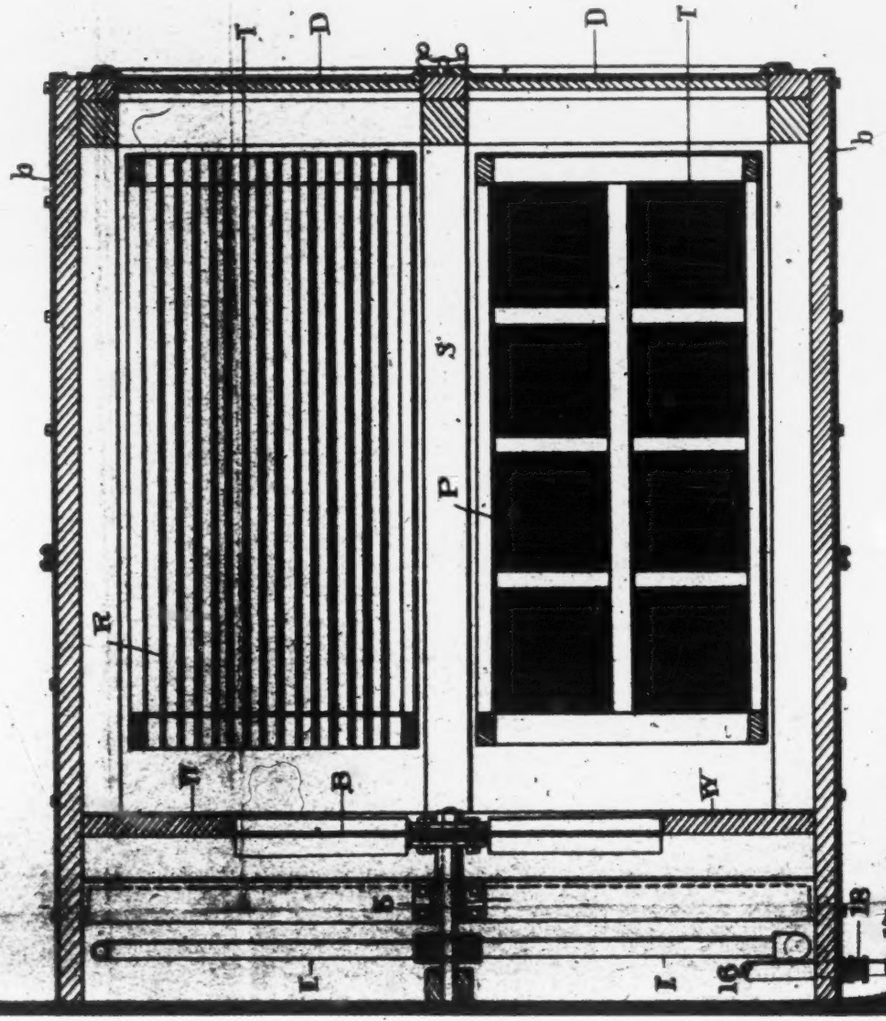

Fig. 3

5 SHEETS—SHEET 3

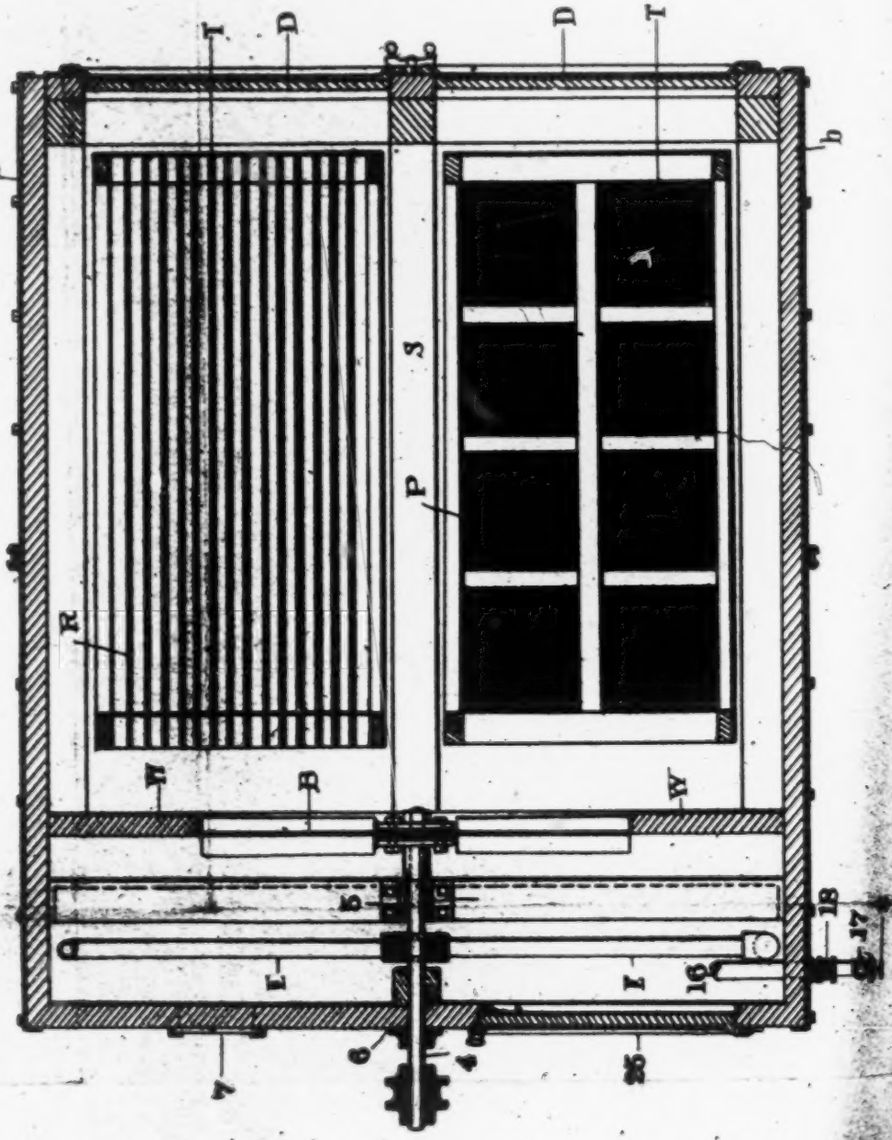

Fig. 3

ATTEST
E. M. Fisher
J. C. Wheeler

INVENTORS
JOHN SCHNIDT
HENRY SCHÜTTE
BY
Fisher & Wheeler

1048

J. SCHMIDT & H. SCHÜTTERLE.

APPARATUS FOR DRYING MACARONI AND LIKE BAKERY PRODUCTS.

APPLICATION FILED JUNE 9, 1911.

1,010,809.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 4

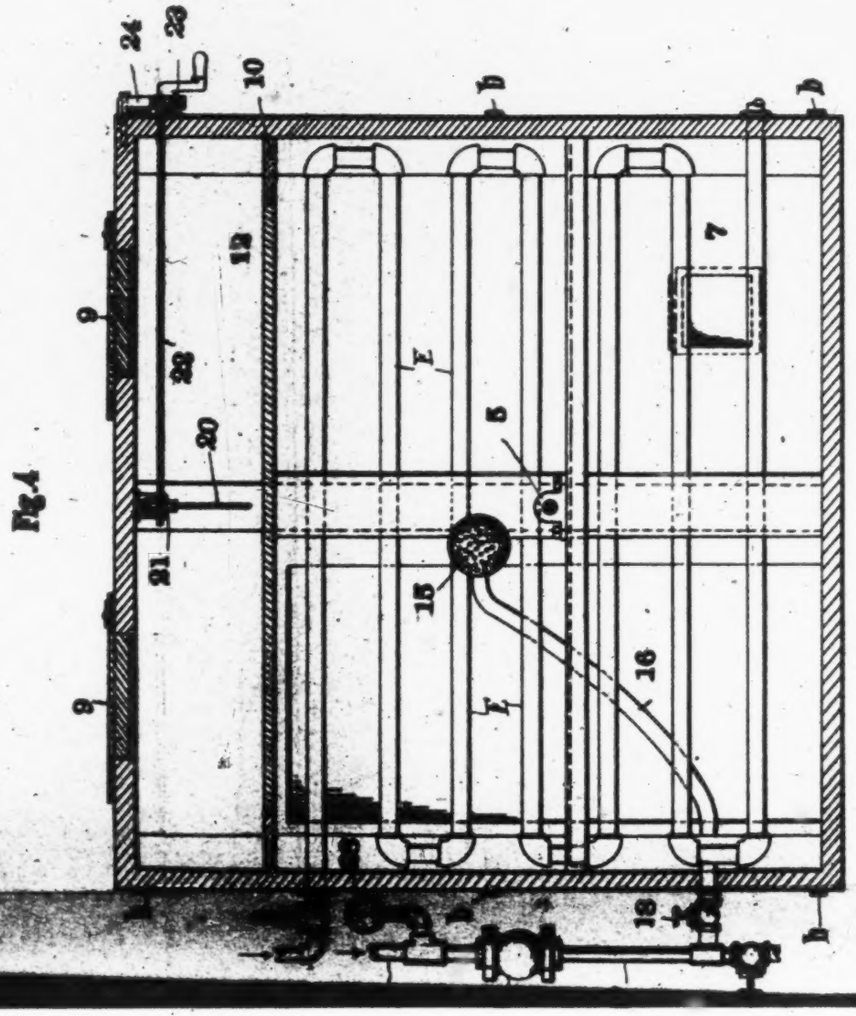

Fig.4

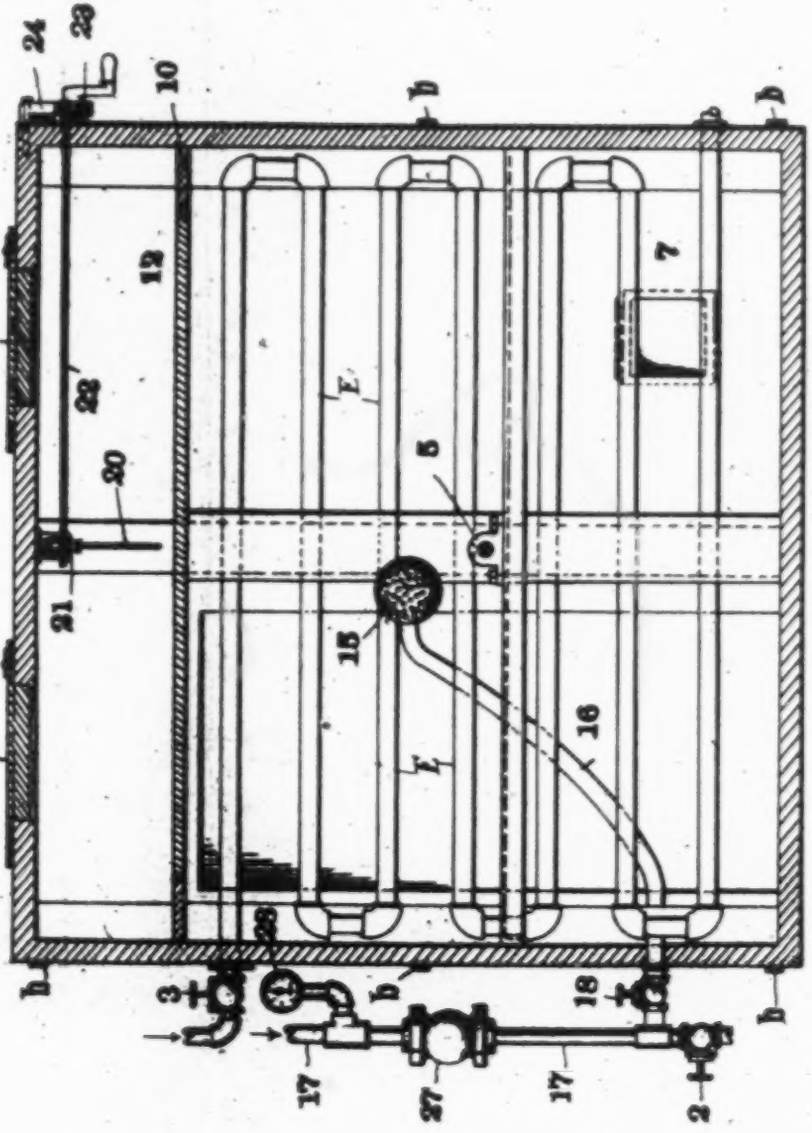

Fig. 1

ATTEST

E. M. Fisher.
K. C. Mussun.

INVENTORS
JOHN SCHMIDT
HENRY SCHÜTTERLE

BY Fisher Thurston ATTYS.

1049

J. SCHMIDT & H. SCHÜTTERLE.

APPARATUS FOR DRYING MACARONI AND LIKE BAKERY PRODUCTS.

APPLICATION FILED JUNE 9, 1911.

1,010,809.

Patented Dec. 5, 1911.

5 SHEETS—SHEET 5.

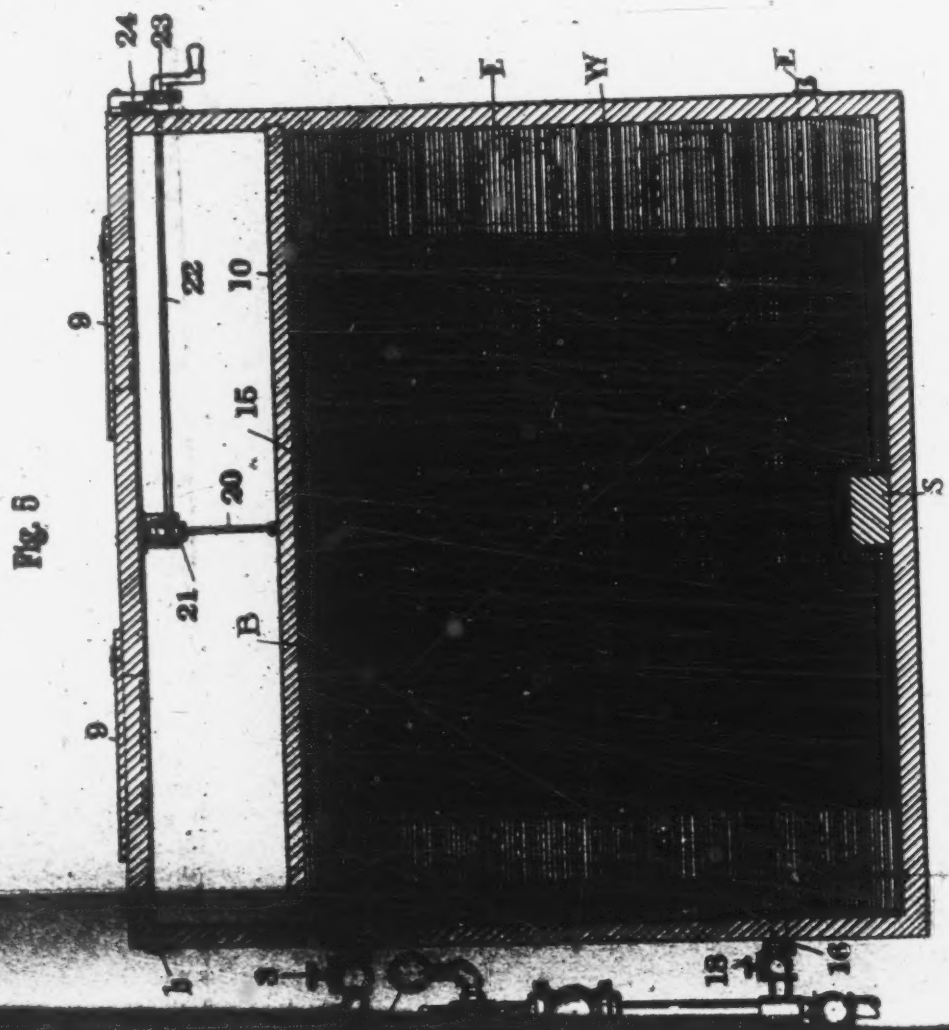

Fig. 5

1,010,809.

5 SHEETS—SHEET 5.

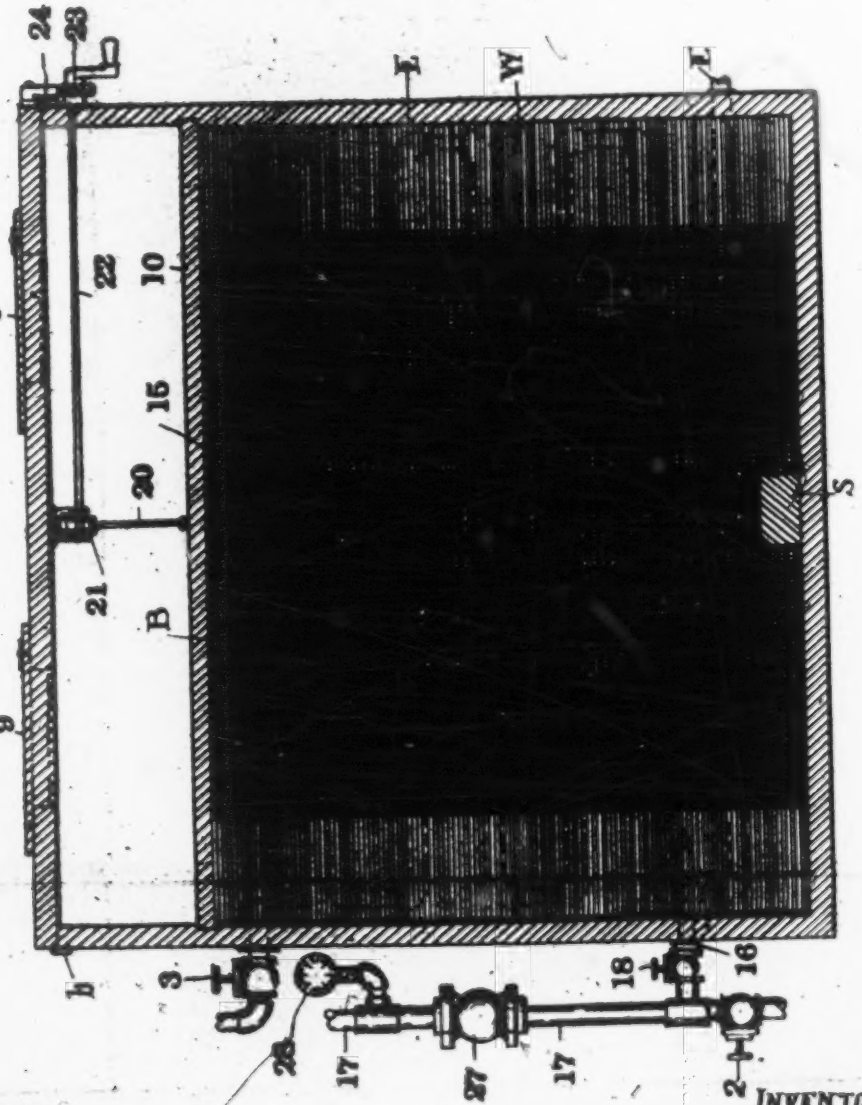

Fig. 5

ATTEST

E. M. Fisher

F. C. Mussun

INVENTORS

JOHN SCHMIDT

HENRY SCHÜTTERLE

By Fisher & Mussun

Attys.

UNITED STATES PATENT OFFICE.

JOHN SCHMIDT AND HENRY SCHÜTTERLE, OF CHARDON, OHIO.

APPARATUS FOR DRYING MACARONI AND LIKE BAKERY PRODUCTS.

1,010,809. Specification of Letters Patent. Patented Dec. 5, 1911.

Application filed June 9, 1911. Serial No. 632,155.

To all whom it may concern:

Be it known that we, JOHN SCHMIDT and HENRY SCHÜTTERLE, citizens of the United States, residing at Chardon, in the county of Geauga and State of Ohio, have invented certain new and useful Improvements in Apparatus for Drying Macaroni and Like Bakery Products, of which the following is a specification.

This invention has reference to apparatus for drying macaroni and like bakery products, and the invention consists in the construction and combination of parts substantially as shown and described and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a perspective view of the invention. Fig. 2 is a longitudinal sectional elevation thereof substantially through the center. Fig. 3 is a longitudinal sectional plan view of the invention. Fig. 4 is a cross sectional elevation through the heating chamber, and Fig. 5 is a cross sectional view through the drying chamber showing the blower in the rear.

The apparatus as thus shown is designed especially for drying macaroni, but is not necessarily limited to this single use or product.

As shown the invention comprises an inclosure which is say about nine feet in length by about seven feet in width and about six feet in height, over all, and within this outer wall there are several distinct compartments. In the present views we show straps or bands *b* about the said wall as may be needed to hold the same firmly together, and the interior of the apparatus is variously sub-divided into chambers and compartments as the work to be done may require. Thus, the front and main portion of the apparatus comprises the drying chamber which is divided somewhat arbitrarily into two compartments longitudinally, the base [illegible] of the main frame we find it advantageous to provide a series of racks R upon which the macaroni can be hung or suspended, while for other purposes we may use a series of wire screen pans P. These pans may be arranged in tiers one above the other and adapted to be bodily drawn out and replaced if preferred. Either or both kinds of trucks can be used, or their equivalent, according to kind or nature of stock to be dried. A transverse wall W separates the said compartments for the heater chamber, and the steam coils or pipes E for heating the air for the dried chamber are located in the said heater chamber. Control of the steam flowing through these coils or pipes is by valves 2 and 3, or their equivalent, outside the main wall of the apparatus. A fan or blower B is located in a suitable opening in the wall W, and said blower is driven by shaft 4 from any suitable source of power, said shaft being supported in suitable bearings 5 and 6 and extending through the rear wall of the apparatus for power connections.

Admission of air to the heating chamber and exhaust is by means of suitable doors or dampers disposed here and there as the necessary ventilation may suggest. For example, the bottom rear door 7 may be raised more or less and sustained in raised position by counterweighted chain 8, or its equivalent, and in that case exit or exhaust would be say by door or doors 9 in the top of the apparatus, the circulation of air being through exhaust fan or blower B and through the drier compartments beneath the false top 10. But if for any reason it be desirable to merely circulate the air within the apparatus under increasing heat conditions the respective inlets and outlets will be closed and the door or damper 12 in the top 10 be opened, say about as seen in Fig. 2, more or less. This extends across over the top of the heating chamber, and

Application filed June 9, 1911. Serial No. 632,155.

To all whom it may concern:

Be it known that we, JOHN SCHMIDT and HENRY SCHÜTTERLE, citizens of the United States, residing at Chardon, in the county of Geauga and State of Ohio, have invented certain new and useful Improvements in Apparatus for Drying Macaroni and Like Bakery Products, of which the following is a specification.

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Admission of air to the heating chamber and exhaust is by means of suitable doors or dampers disposed here and there as the necessary ventilation may suggest. For example, the bottom rear door 7 may be raised more or less and sustained in raised position by counterweighted chain 8, or its equivalent, and in that case exit or exhaust would be say by door or doors 9 in the top of the apparatus, the circulation of air being through exhaust fan or blower B and through the drier compartments beneath the false top 10. But if for any reason it be desirable to merely circulate the air within the apparatus under increasing heat conditions the respective inlets and outlets will be closed and the door or damper 12 in the top 10 be opened, say about as seen in Fig. 2, more or less. This extends across over the top of the heating chamber, and with the blower in operation the air will be caused to travel in a circuit through the apparatus and the increasing heat thereof will take care of any further absorbed moisture.

Sometimes it occurs that the condition of the material on the racks or in the pans requires more surface moisture than it possesses inherently, and in such cases we employ a steam spray 15 which more or less saturates the air and meets the requirements. This spraying head is connected by pipe 16 with the main steam supply pipe

17 and is controlled by valve 18. The door 12 is controlled in this instance from the side of the apparatus by a cord 20 over sheave 21 on rod 22 which has a ratchet head 23 outside the main wall and a pawl 24 to engage and hold the same. Entrance to the heating chamber is by door 25, Fig. 3. A steam pressure reducing valve 27 is employed in the steam pipe connection between valves 2 and 3 and a pressure gage 28 is shown in connection with said pipe 17.

What we claim is:

1. An apparatus for drying macaroni having a drying compartment provided with a draft passage front to rear in its top, and a door opening from the outside into the rear of said passage, a heating chamber across the rear of said drying compartment and a door at its top from said passage, a blower between said heating chamber and said compartment and a spraying device in said heating chamber.

2. An apparatus for drying macaroni having drying compartments side by side and a door to enter a truck at the front of each compartment opening down to the floor thereof, a heating chamber and a wall between the same and said compartments and steam heating pipes in said chamber, a blower to force the air from said heating chamber into said drying compartments located in the said wall, a draft passage over said compartments front to rear, a door opening from the discharge end of said passage into said heating chamber, and means in said drying chamber to moisten the air therein.

3. A macaroni drying apparatus comprising a heating chamber and a drying compartment in front thereof and a wall between said chamber and compartment, a rotary blower in said wall adapted to discharge into said compartment, a steam spray in said heating chamber behind said blower and arranged to discharge toward the same, and a steam supply pipe and valves to control the flow of steam to said spray.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN SCHMIDT.
HENRY SCHÜTTERLE.

Witnesses:
MIKE SHULLER,
SAM A. BARBER.

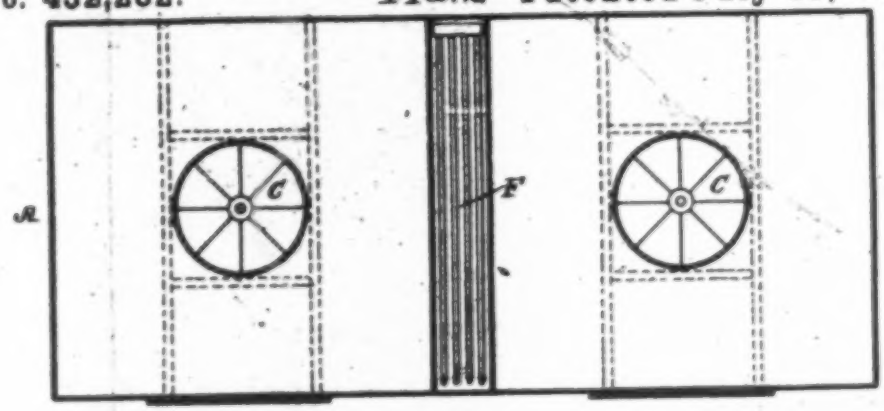
1052

(No Model.)

J. K. PROCTOR & J. H. KNOWLES.

DRYING MACHINE.

No. 432,282. FIG. 2. Patented July 15, 1890.



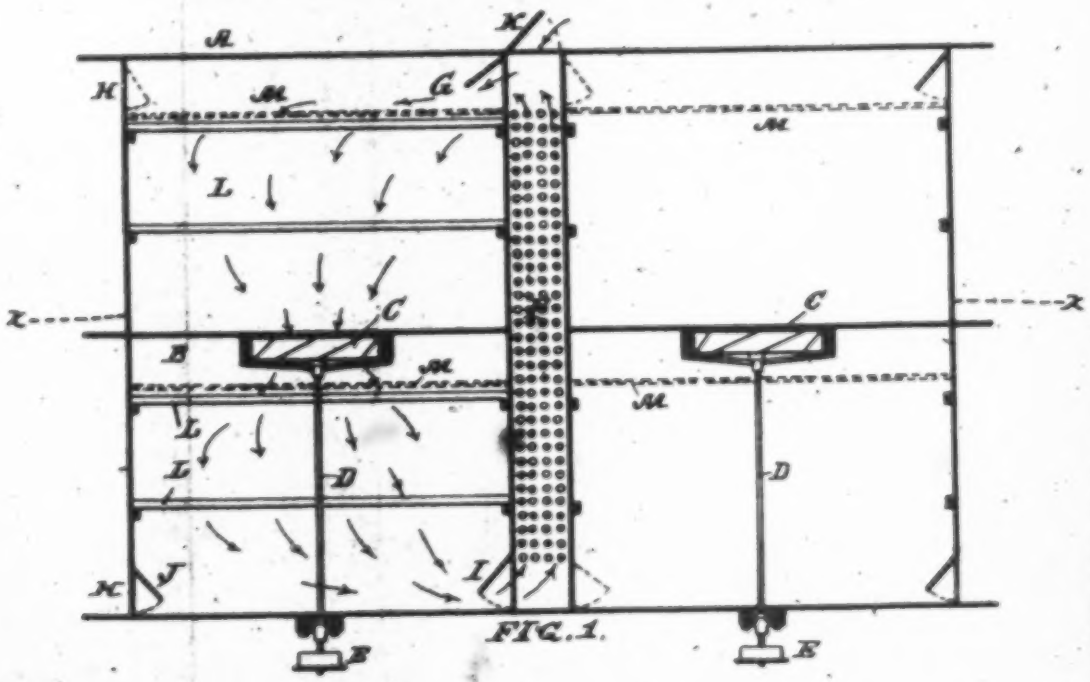


FIG. 1.

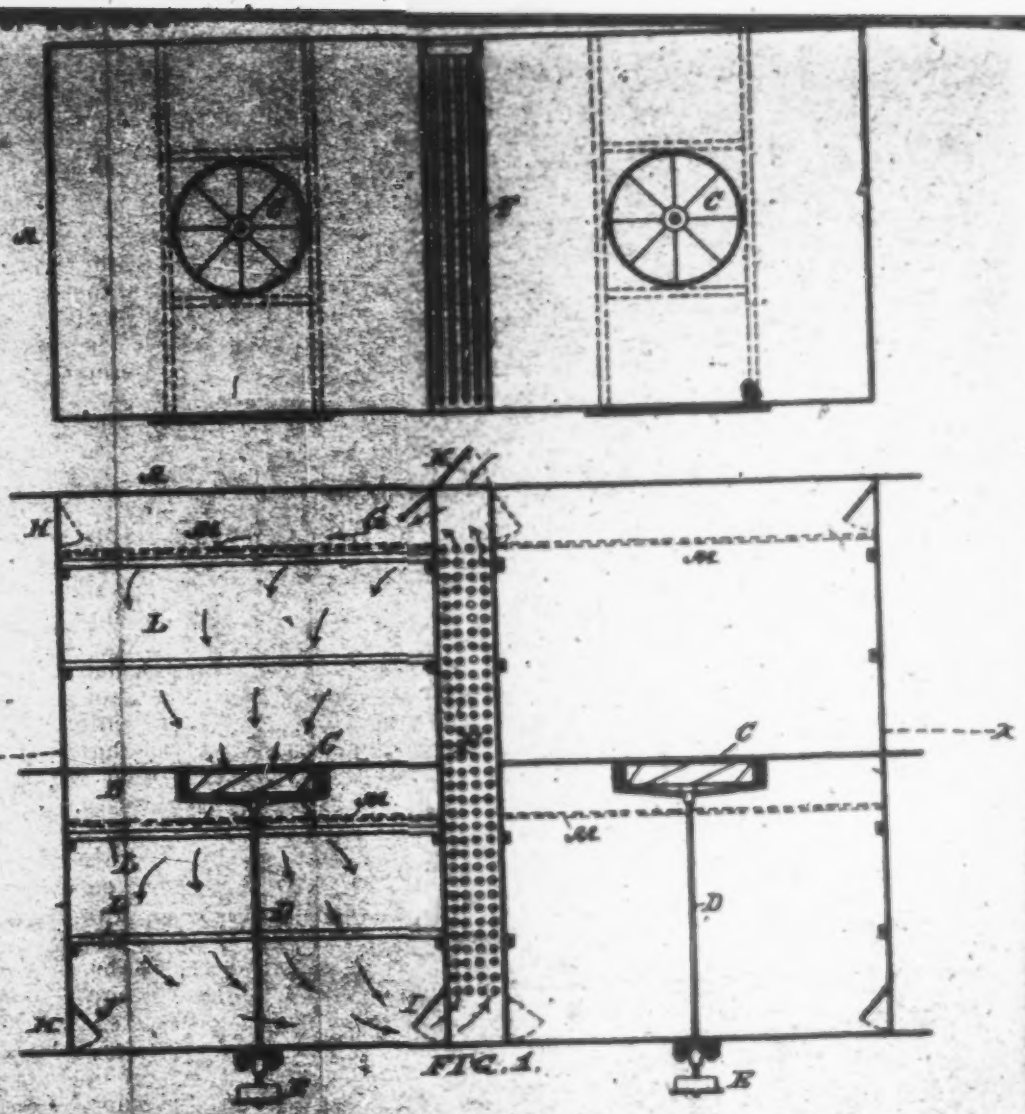


FIG. 1.

WITNESSES:
Robert Hutchinson
George Dewey

INVENTORS:
E.K. PRESTON
AND
C.H. MORSE
BY THEIR ATTY

UNITED STATES PATENT OFFICE.

JOSIAH K. PROCTOR AND JOHN HENRY KNOWLES, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE PHILADELPHIA TEXTILE MACHINERY COMPANY, OF SAME PLACE.

DRYING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 439,282, dated July 15, 1890.

Application filed January 19, 1889. Serial No. 296,828. (No model.)

To all whom it may concern:

Be it known that we, JOSIAH K. PROCTOR and JOHN H. KNOWLES, both of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Drying-Machines, of which the following is a specification.

Our invention relates to drying-machines; and it consists of certain improvements, all of which are fully set forth in the following specification, and shown in the accompanying drawings, which form a part thereof.

More particularly this invention relates to that class of drying apparatus in which the air is circulated through or among the material to be dried by means of suitable air-circulating devices. Our apparatus is not confined to the drying of any particular kind of material, but is equally suited to any kind of materials or goods which can be distributed through the drying-room so as to provide numerous vertical air-spaces somewhat evenly distributed.

The object of this invention is to arrange the parts of the drying apparatus (hereinafter for convenience of expression called a "drier") in a novel manner, so that the air used in drying shall be heated outside of the rooms or chambers containing the materials or goods, and then be passed into the rooms and be distributed evenly through and among the material.

In the drawings, Figure 1 represents a longitudinal vertical section of a pair of our improved drying-rooms, and Fig. 2 is a horizontal sectional view of the same on the line [illegible] of Fig. 1.

In all the figures the same letters of reference refer to similar parts, and the arrows show the direction of the air-currents.

erably made to occupy one floor of a building and of a sufficient height for a workman to enter and work comfortably in it.

A is the drying-room divided into upper and lower compartments by the floor B and provided with suitable doors for the entrance of the operators into the chambers. The floor B is provided with an opening or hole, preferably in the center, leading from one compartment to the other.

C is a fan located at the opening in the floor B, preferably immediately below it, for circulating the air. D is the shaft-bearing, and E the pulley, for supporting and driving this fan.

F is the steam-heating coil placed in a separate compartment just outside of the drying-room proper, (which for convenience we will hereinafter term the "heating-chamber.") The drying-room A is provided at its top or upper portion with passages G and H, communicating, respectively, with the heating-chamber F and the external air and at its bottom or lower portion with corresponding passages I and J, also communicating, respectively, with the heating-chamber and external air at the bottom. The heating-chamber F is provided with a passage K, communicating at its top with the air external to the chamber. All of these passages are provided with suitable doors which may be opened or closed, as desired, to regulate the temperature and humidity of the air in the drying-room, as hereinafter set out.

The operation of the machine is as follows: Supposing the material to be dried to be yarn hung upon supports L. The passages J, H, and K are closed and G and I are opened, and by the operation of the fan the air is circulated through the drier and the heating-cham-

DRYING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 432,982, dated July 15, 1890.

Application filed January 10, 1889. Serial No. 296,838. (No model.)

To all whom it may concern:

Be it known that we, JOSIAH K. PROCTOR and JOHN H. KNOWLES, both of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Drying-Machines, of which the following is a specification.

Our invention relates to drying-machines; and it consists of certain improvements, all of which are fully set forth in the following specification, and shown in the accompanying drawings, which form a part thereof.

More particularly this invention relates to that class of drying apparatus in which the air is circulated through or among the material to be dried by means of suitable air-circulating devices. Our apparatus is not confined to the drying of any particular kind of material, but is equally suited to any kind of materials or goods which can be distributed through the drying-room so as to provide numerous vertical air-spaces somewhat evenly distributed.

The object of this invention is to arrange the parts of the drying apparatus (hereinafter for convenience of expression called a "drier") in a novel manner, so that the air used in drying shall be heated outside of the rooms or chambers containing the materials or goods, and then be passed into the rooms and be distributed evenly through and among the material.

In the drawings, Figure 1 represents a longitudinal vertical section of a pair of our improved drying-rooms, and Fig. 2 is a horizontal sectional view of the same on the line x x of Fig. 1.

In all the figures the same letters of reference refer to similar parts, and the arrows show the direction of the air-currents.

Although the drawings show two driers side by side, we will first proceed with our description as if there were but one drier, since each is like the other in construction, and afterward speak of the relation which the two have to each other. Each drier is composed of two rooms or chambers—an upper and a lower chamber—each entirely separate from the other, except as hereinafter described, and each of these chambers is preferably made to occupy one floor of a building and of a sufficient height for a workman to enter and work comfortably in it.

A is the drying-room divided into upper and lower compartments by the floor B and provided with suitable doors for the entrance of the operators into the chambers. The floor B is provided with an opening or hole, preferably in the center, leading from one compartment to the other.

C is a fan located at the opening in the floor B, preferably immediately below it, for circulating the air. D is the shaft-bearing, and E the pulley, for supporting and driving this fan.

F is the steam-heating coil placed in a separate compartment just outside of the drying-room proper, (which for convenience we will hereinafter term the "heating-chamber.") The drying-room A is provided at its top or upper portion with passages G and H, communicating, respectively, with the heating-chamber F and the external air and at its bottom or lower portion with corresponding passages I and J, also communicating, respectively, with the heating-chamber and external air at the bottom. The heating-chamber F is provided with a passage K, communicating at its top with the air external to the chamber. All of these passages are provided with suitable doors which may be opened or closed, as desired, to regulate the temperature and humidity of the air in the drying-room, as hereinafter set out.

The operation of the machine is as follows: Supposing the material to be dried to be yarn hung upon supports L. The passages J, H, and K are closed and G and I are opened, and by the operation of the fan the air is circulated through the drier and the heating-chamber F. When the air is thus recirculated, it will become highly heated by constantly passing through the heating-chamber and very moist by absorbing the moisture from the material through which it passes in the drier, and when it has become sufficiently heated or sufficiently moist the passage J is opened to allow the damp and hot air to escape from the drier, and the passage K over the heater is opened to admit a supply of fresh cold air

to the drier. It is a great advantage to have the fresh air enter the drying-room by the passage K over the heating-chamber, as the dry and cool air is thus at once intermingled with the hot air arising from the heater, and the air entering through the passage G into the drier will be of one even temperature; but where it is not practical to have this opening K over the heater any other opening into the top of the drier may be used for this purpose—as, for instance, that at H. When the drying process is completed and it is desired to rapidly reduce the temperature in the drier, so that a workman may enter for the purpose of recharging the drier, the passages G and I, leading to the heating-chamber, are closed, and the passages H and J, leading to the external air, are fully opened. Cold air rushes in at H and is discharged at J, rendering the temperature within the drier comfortable to work in. If desired, during the whole process of taking the goods out and recharging the drier the fan C may be kept running, (preferably at a slower speed than usual,) so as to produce a grateful temperature to work in. In summer-time such a circulation of air during the recharging process is exceedingly pleasant and desirable. In drying other material than yarn some manipulation of the doors over the passages other than that described may be required for the goods in hand; but it will be seen that these doors may be regulated and adjusted to produce and maintain any required temperature or degree of humidity in the drier. In some cases the doors over the passages may be dispensed with, and a continued and uniform discharge of air may be maintained, and when heated air is not required, or where heat may injure the goods, the heater F may be dispensed with and cold air only circulated through the driers. Partitions may be used, for the purpose of dividing and evenly distributing the air through the drier, perforated barriers or partitions M may be placed across the chambers as indicated in dotted lines in Fig. 1.

In the drawings I have shown two driers adjoining one another with a common heating-chamber and a single heater between them. While each drier may have its own [illegible] to be used in connection with a single drier, it is an economical arrangement to place the driers as shown. When the two driers are placed side by side, as shown, we prefer to operate them alternately, using the heater first for the one and then for the other. The doors over the passages leading from the driers to the heating-chamber are alternately opened and closed, so that first one and then the other drier shall be connected with the common heating-chamber. During the time one drier is in operation the other drier may be recharged. Thus the steam is never shut off from the heater while the driers are in operation; but the heater is in constant use, first for one and then for the other drier, avoiding a loss of heat, which could not be prevented were the heater-rooms inoperative during the recharging process.

Instead of a fan—such as shown in the drawings—for moving the air, any other suitable air-moving device may be employed; and we do not limit ourselves to the mere details of construction here shown, as it is apparent that they may be varied in many ways without departing in the least from the principles of our invention.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

In a drier, the combination of the following elements: a floor or partition dividing the drier into upper and lower compartments or rooms, the said floor or partition being provided with an opening forming a vertically-communicating passage-way between the rooms and being closed or air-tight except as to said opening, an air-circulating fan located in said opening for sucking air through one compartment and forcing it through the other, an external passage-way connecting the upper and lower compartments, heating pipes in said external passage-way, an adjustable door between each of said compartments and said external passage-way, and an adjustable door in each compartment between the external atmosphere and the compartment, so arranged that cold air may be drawn into the upper and discharged from the lower compartment without passing through the passage-way containing the heating-pipes, all as and for the purposes described.

In testimony of which invention we hereunto set our hands.

JOSIAH K. PROCTOR.
JOHN HENRY KNOWLES.

Witnesses:
SAMUEL W. THACKRUR,
WALTER A. KREIDER.

1055

D. W. SHARES.

Cultivator.

No, 11,460. Patented Aug. 1, 1854.

Fig. 1.

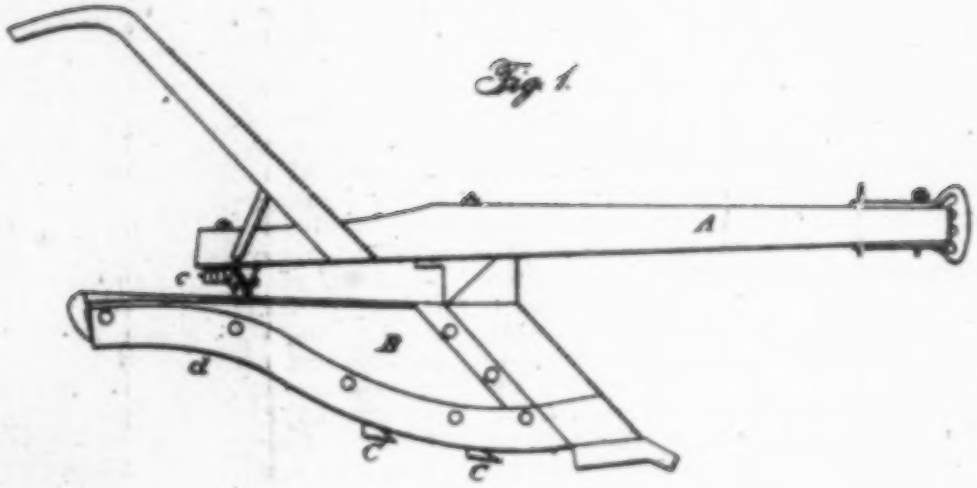


Fig. 2.

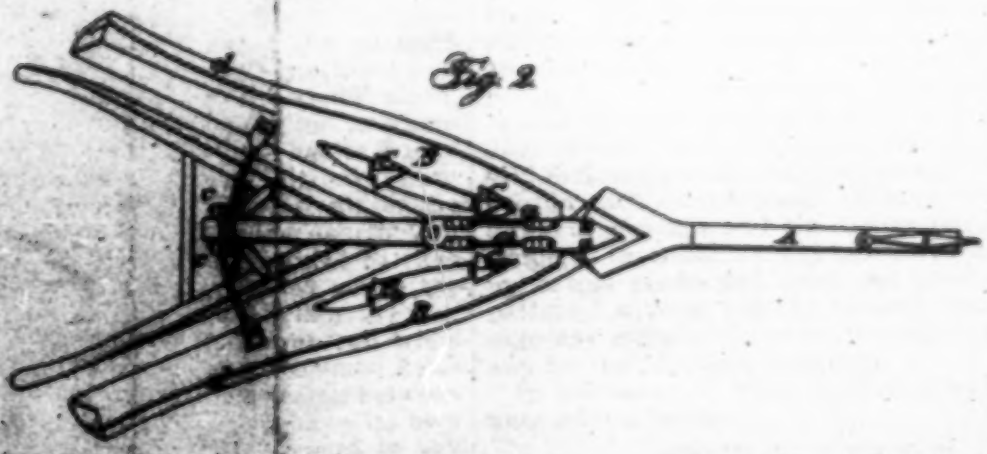


Fig. 3

No. 11,460. Patented Aug. 1, 1854.

Fig. 1.

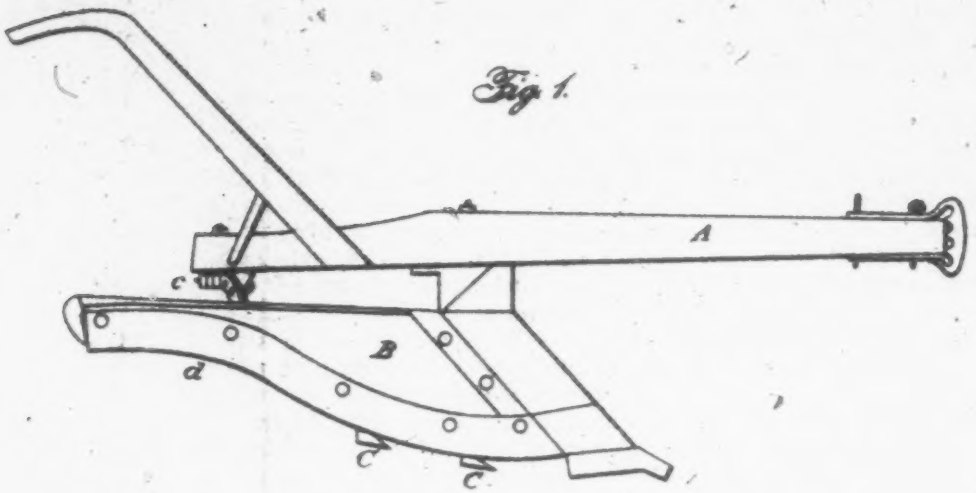


Fig. 2.

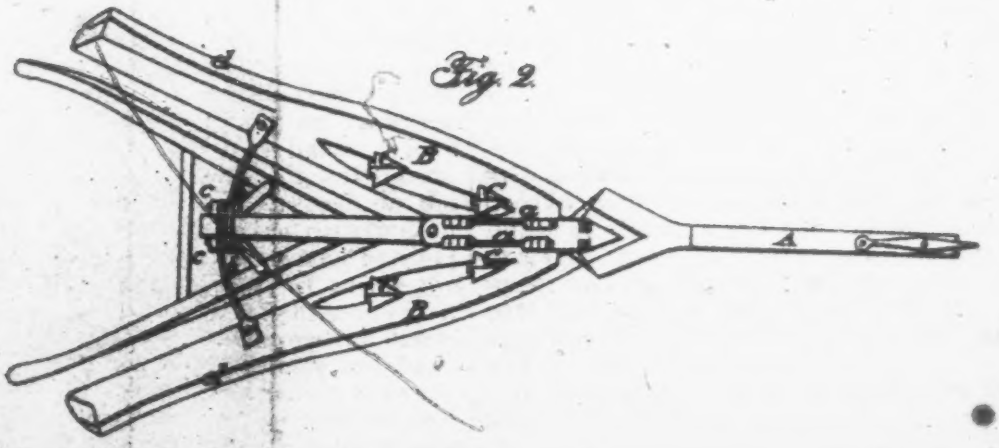
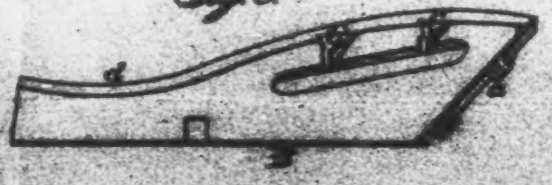


Fig. 3.



UNITED STATES PATENT OFFICE.

DANIEL W. SHARES, OF HAMDEN, CONNECTICUT.

IMPROVEMENT IN CULTIVATORS.

Specification forming part of Letters Patent No. 11,460, dated August 1, 1854.

To all whom it may concern:

Be it known that I, DANIEL W. SHARES, of Hamden, in the county of New Haven and State of Connecticut, have invented a certain new and useful Improvement in Hoeing-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form part of this specification, and in which—

Figure 1 represents a side view of my improved machine; Fig. 2, an inverted plan or under view, and Fig. 3 an inside view of one of the wings or scrapers detached.

The machine represented in the accompanying drawings is of plow form or build, and is designed to be used in hoeing corn, potatoes, or other vegetable produce growing in hills or rows. It is drawn by horse or cattle in front, and guided or held by hand behind, as in operating the ordinary plow, the horse being hitched to the draft-bar A and walking in between the hills or rows. Thus operating, the hoeing is effected by wings or scrapers B, one on either side, diverging or spreading outward, backwardly, and set inclined or beveled on their outside faces, so as to present greater width or distance apart between their bottom than their top edges. These wings are hinged at their front ends by hinges *a*, for the purpose of contracting and expanding them at pleasure, to suit different widths of furrows or distances apart of the rows or hills, screw-bolts *c* or pins passing through bars *b* at the back, provided with suitable perforations, and lapping one over the other, serving to hold the wings apart when set. This arrangement of expanding and contracting wings is common to corn-plows having wings of either [illegible]

is commonly done in hoeing them by hand after the travel of the ordinary plow or cultivator between them, the entire bottom or scraping edge of each wing being of corresponding configuration to the transverse section of one-half (nearly) of the row and its furrow, and thus the two wings combined shape the furrow and one-half of each row on either side, the return or run of the machine along the adjoining furrows serving to hoe the opposite sides of the rows and simultaneously to hoe the one side of an adjoining row and shape the furrow as before. If the plant be in hills instead of rows, the wings similarly act in shaping them by running the machine breadthwise as well as lengthwise or diagonally, as may be, of the field between the hills. Thus the machine not only loosens the earth by its plow form in front, but carries or shoves the earth onto the rows or around the hills, leaving the *hills or rows of the proper shape*, answering most effectually the purpose of a hoe, as the narrow crooked form of the hinder extremity of the wings will work under the leaves of the plant lying on or near the ground instead of covering them with soil, as is the case with the common plow or cultivator, all after hand-hoeing being dispensed with. The flat shape given to the hill or row at the top by the crook in the hinder extremity of the wing will serve to make the hill or row preserve its form better than if a sharp incline or angle were left, as in the case with the common plow or cultivator.

To prevent the furrow being made or left too [illegible] by the wings or scrapers in passing along the furrow by the weight of the machine thereon or on, which is more particularly [illegible] to be the case in wet land, I attach

IMPROVEMENT IN CULTIVATORS.

Specification forming part of Letters Patent No. 11,469, dated August 1, 1854.

To all whom it may concern:

Be it known that I, DANIEL W. SHARES, of Hamden, in the county of New Haven and State of Connecticut, have invented a certain new and useful Improvement in Hoeing-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form part of this specification, and in which—

Figure 1 represents a side view of my improved machine; Fig. 2, an inverted plan or under view, and Fig. 3 an inside view of one of the wings or scrapers detached.

The machine represented in the accompanying drawings is of plow form or build, and is designed to be used in hoeing corn, potatoes, or other vegetable produce growing in hills or rows. It is drawn by horse or cattle in front, and guided or held by hand behind, as in operating the ordinary plow, the horse being hitched to the draft-bar A and walking in between the hills or rows. Thus operating, the hoeing is effected by wings or scrapers B, one on either side, diverging or spreading outward, backwardly, and set inclined or beveled on their outside faces, so as to present greater width or distance apart between their bottom than their top edges. These wings are hinged at their front ends by hinges *a*, for the purpose of contracting and expanding them at pleasure, to suit different widths of furrows or distances apart of the rows or hills, screw-bolts *c* or pins passing through bars *b* at the back, provided with suitable perforations, and lapping one over the other, serving to hold the wings apart when set. This arrangement of expanding and contracting wings is common to corn-plows having wings on either side, as with mine, but of different shape and for a different purpose. In the machine represented in the drawings the wings B are made much deeper at their front than their back ends, the latter having a crook or hollow, *d*, along or in its bottom edge, and gradually blending into a convex figure, which is the shape of the forward part of the bottom edge of the wing, the forward portion of the wing descending into the furrow, and serving, by its convex form, to shape it, while the crook at the back end, by its higher elevation and shape, fairs or forms the rows or hills of the proper shape at the top, leaving, as the machine is drawn along, the hills or rows as perfectly finished as is commonly done in hoeing them by hand after the travel of the ordinary plow or cultivator between them, the entire bottom or scraping edge of each wing being of corresponding configuration to the transverse section of one-half (nearly) of the row and its furrow, and thus the two wings combined shape the furrow and one-half of each row on either side, the return or run of the machine along the adjoining furrows serving to hoe the opposite sides of the rows and simultaneously to hoe the one side of an adjoining row and shape the furrow as before. If the plant be in hills instead of rows, the wings similarly act in shaping them by running the machine breadthwise as well as lengthwise or diagonally, as may be, of the field between the hills. Thus the machine not only loosens the earth by its plow form in front, but carries or shoves the earth onto the rows or around the hills, leaving the hills or rows of the proper shape, answering most effectually the purpose of a hoe, as the narrow crooked form of the hinder extremity of the wings will work under the leaves of the plant lying on or near the ground instead of covering them with soil, as is the case with the common plow or cultivator, all after hand-hoeing being dispensed with. The flat shape given to the hill or row at the top by the crook in the hinder extremity of the wing will serve to make the hill or row preserve its form better than if a sharp incline or angle were left, as is the case with the common plow or cultivator.

To prevent the furrow being made or left too hard by the wings or scrapers in passing along the furrow by the weight of the machine thrown therein or on, which is more particularly apt to be the case in wet land, I attach cultivator-teeth C on the inside of the expanding wings. These teeth may be of the ordinary cultivator form, or they may be of any other suitable shape and be arranged in pairs on either wing, one tooth in advance of the other, and the back teeth of the two wings farther apart than the forward ones, as represented in the drawings, or two teeth, one to either wing, alone may be used; or a series of teeth, as desired. These cultivator-teeth may either be fastened permanently to the wings, projecting downward on their inside to or below the lower edges of the wings or scrapers, or they may be fast to a loose timber or plate

secured at pleasure to the wings for the convenience of detaching them when their use is not requisite, or be otherwise secured to the wings. The use of them is, as before specified, to prevent the furrow being made too hard by the travel of the machine in it, by breaking up and loosening the top-hardened surface, the teeth not penetrating deep or destroying the shape of the hill or row. The benefit of thus loosening the soil is well known, and by the disposition of the teeth on the expanding and contracting wings, as specified, it will be obvious that whatever the width of the furrow or distance of the rows or hills apart this breaking and loosening of the soil will always be made at or near the foot of the hills or rows and in the furrows, thus opening the soil where it is best for the roots of the plants.

I do not claim of themselves the expanding and contracting wings, as such have before been used in corn-plows and cotton-scrapers; but

I do claim as new and useful and desire to secure by Letters Patent—

Providing the expanding and contracting hoeing-wings B on either side with cultivator-teeth C, projecting downward on the inside of the hoeing wings or scrapers, as and for the purposes specified.

In testimony whereof I have hereunto subscribed my name.

DANIEL W. SHARES.

Witnesses:
SIDNEY S. BENHAM,
CLEORA GILBERT.

1058

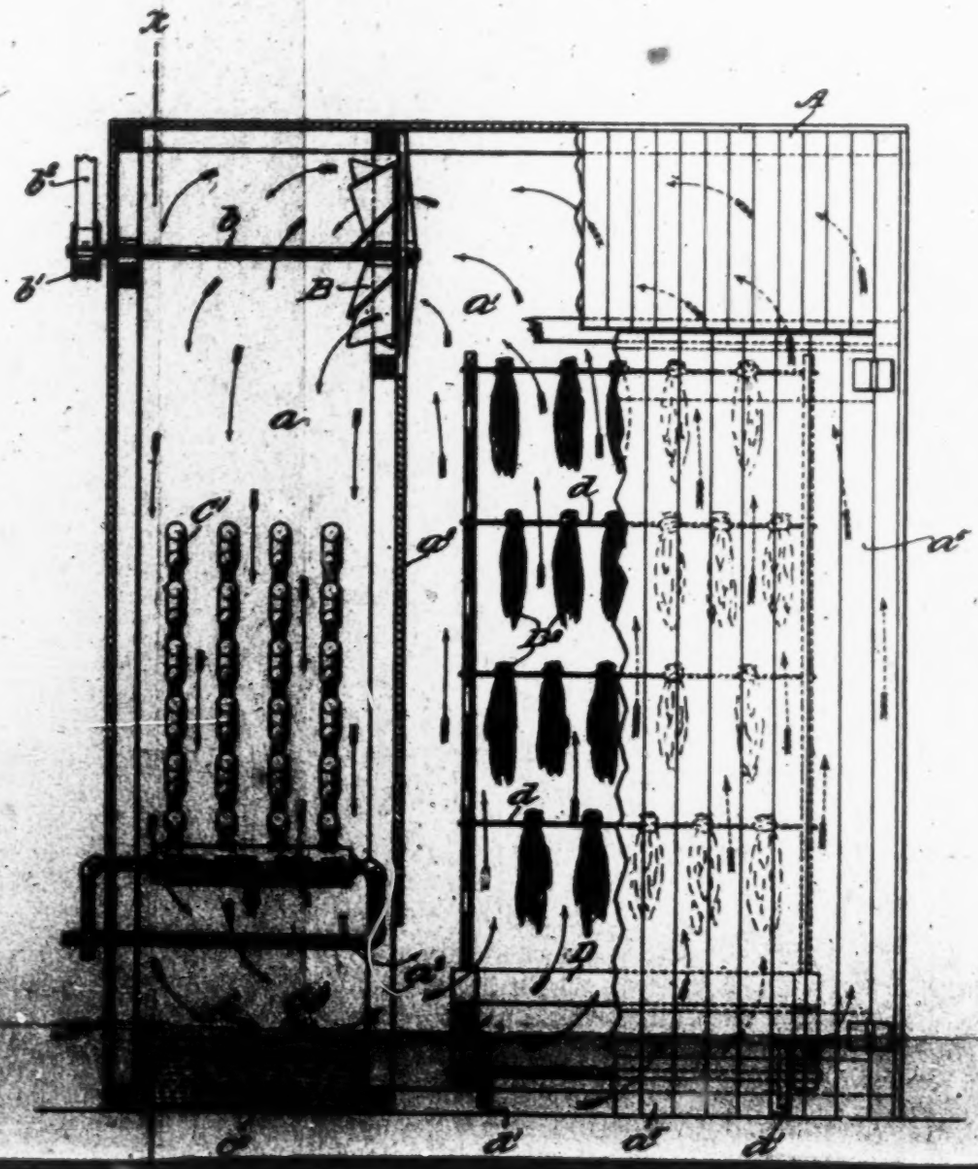
(No Model.) 6 Sheets—Sheet 1.

C. W. SCHWARTZ, Jr.

METHOD OF AND APPARATUS FOR ORDERING TOBACCO.

No. 535,175. Patented Mar. 5, 1895.

Fig: 1


x
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b'
B
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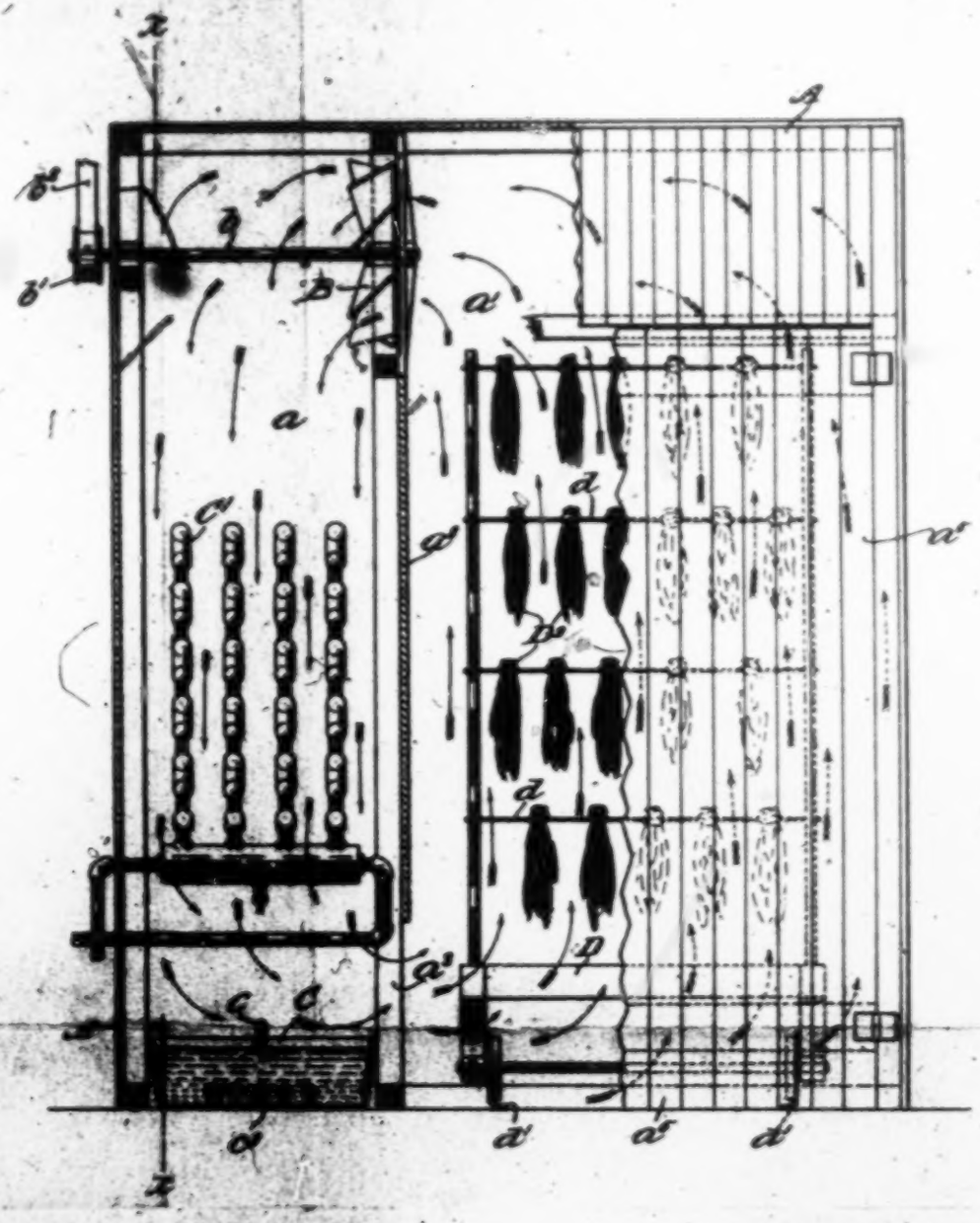
a'
a'
a'

Fig: 1



Witnesses:
Thomas M. Smith
Roland C. Minnett

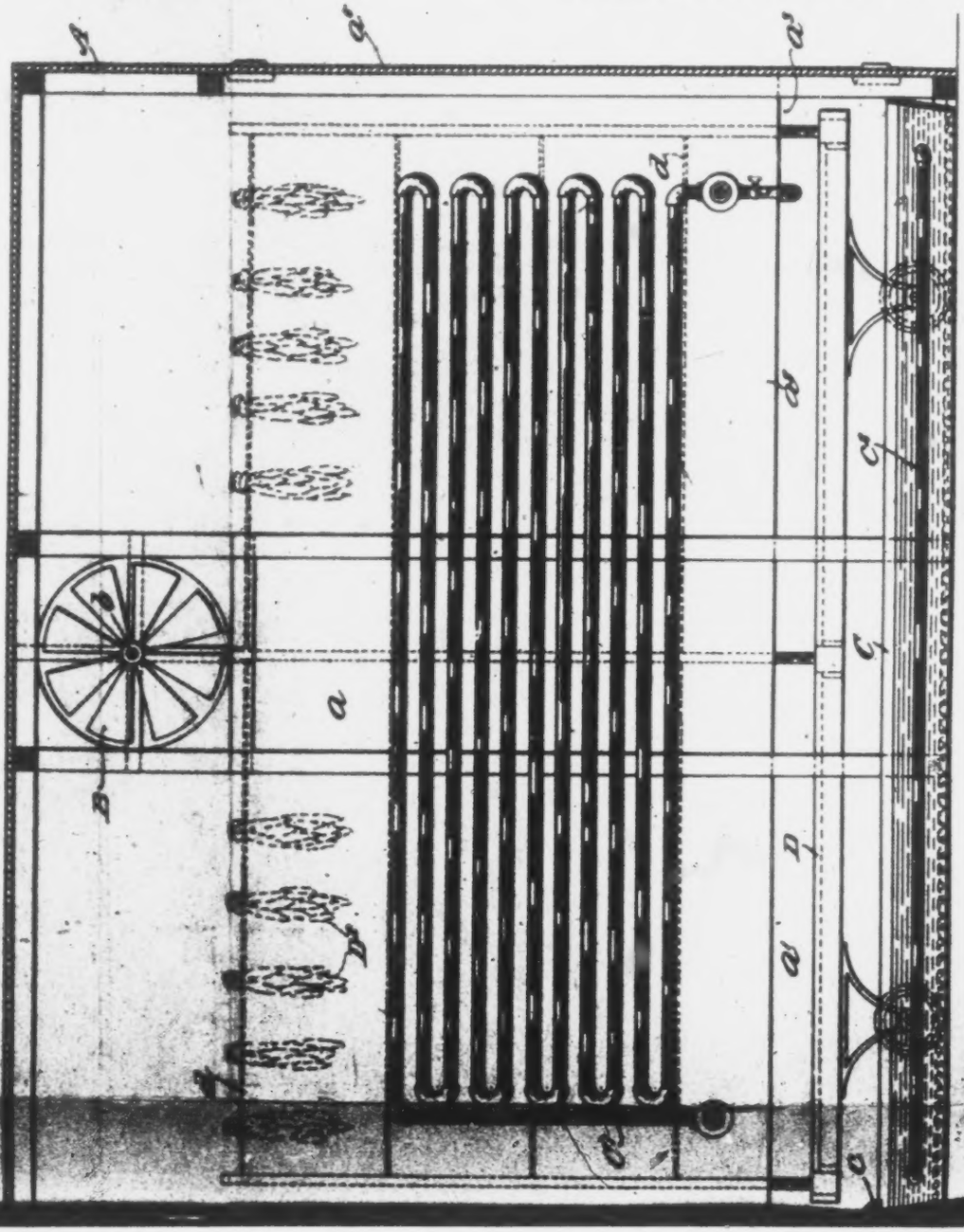
Inventor.
Charles H. Schumacher Jr.
by J. Wallace Dayton
Attorney.

(No Model.) 6 Sheets—Sheet 2.

C. W. SCHWARTZ, Jr.

METHOD OF AND APPARATUS FOR ORDERING TOBACCO.

No. 535,175. Patented Mar. 5, 1895.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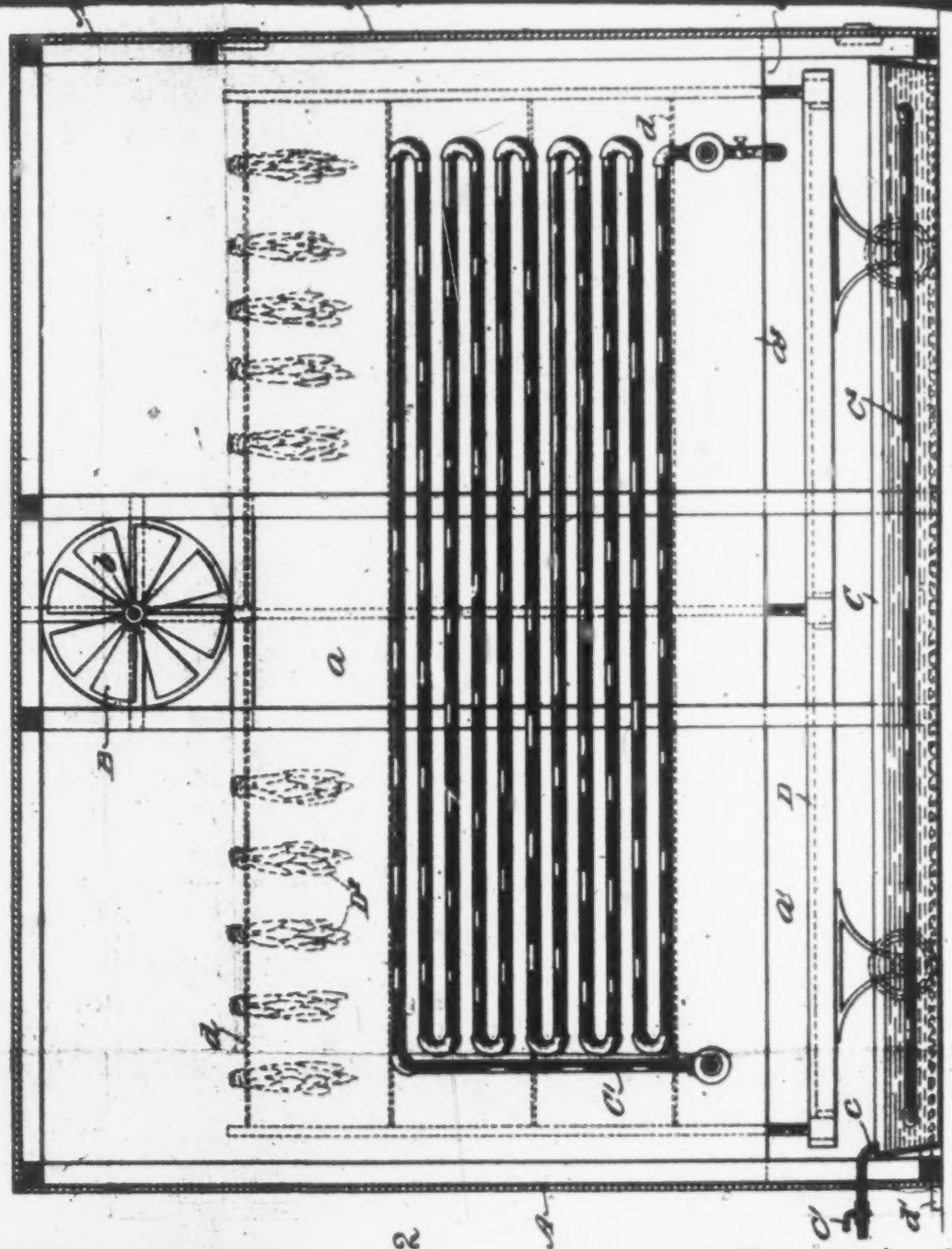
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1060

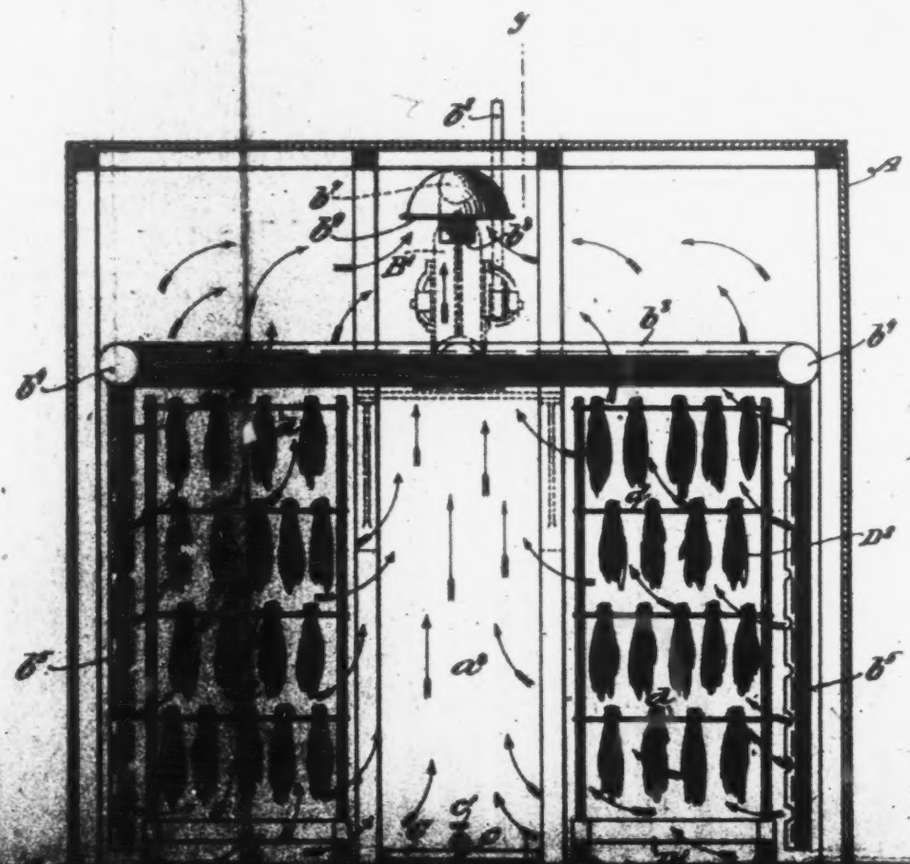
(No Model.) 6 Sheets—Sheet 3.

C. W. SCHWARTZ, Jr.

METHOD OF AND APPARATUS FOR ORDERING TOBACCO.

No. 535,175. Patented Mar. 5, 1895.

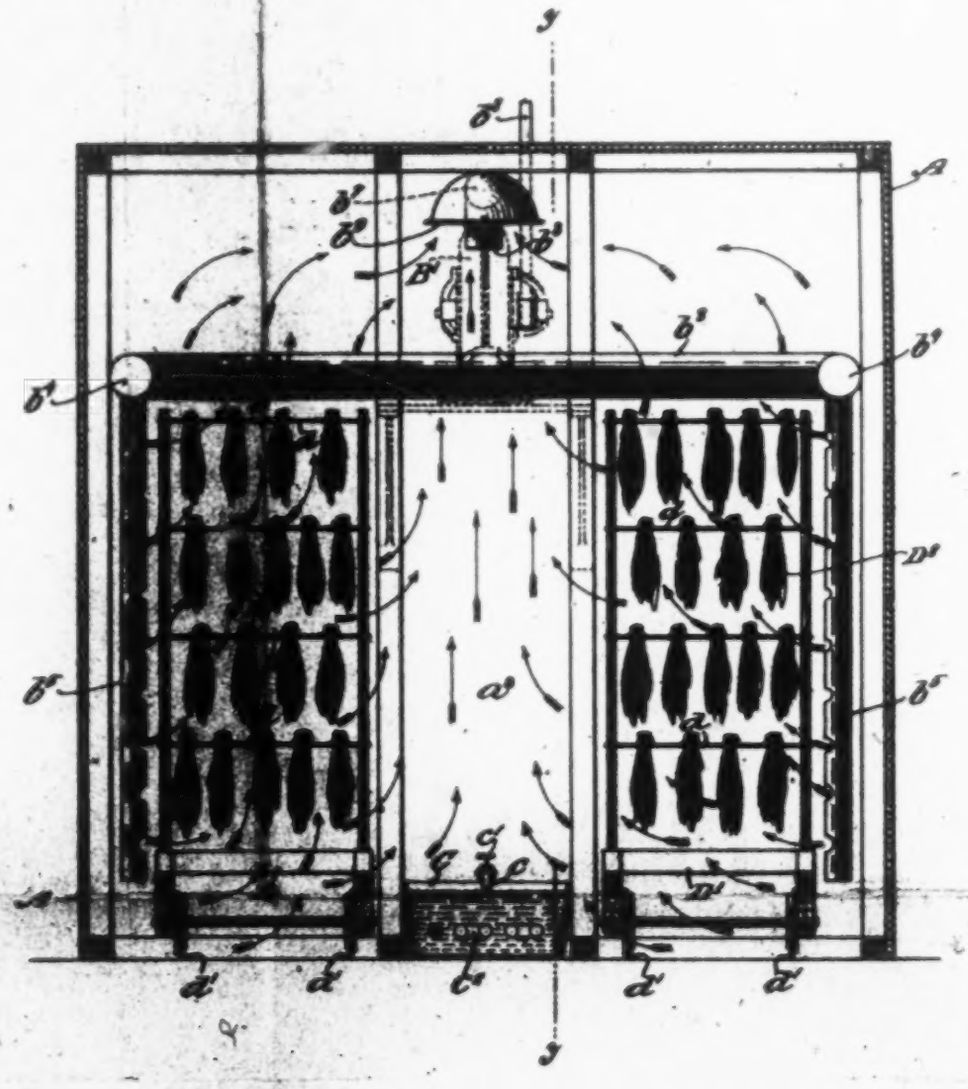
Fig: 3



METHOD OF AND APPARATUS FOR CURING TOBACCO.

No. 535,175. Patented Mar. 5, 1895.

Fig: 3



Witnesses:
Thomas M. Smith,
Richard B. Newell.

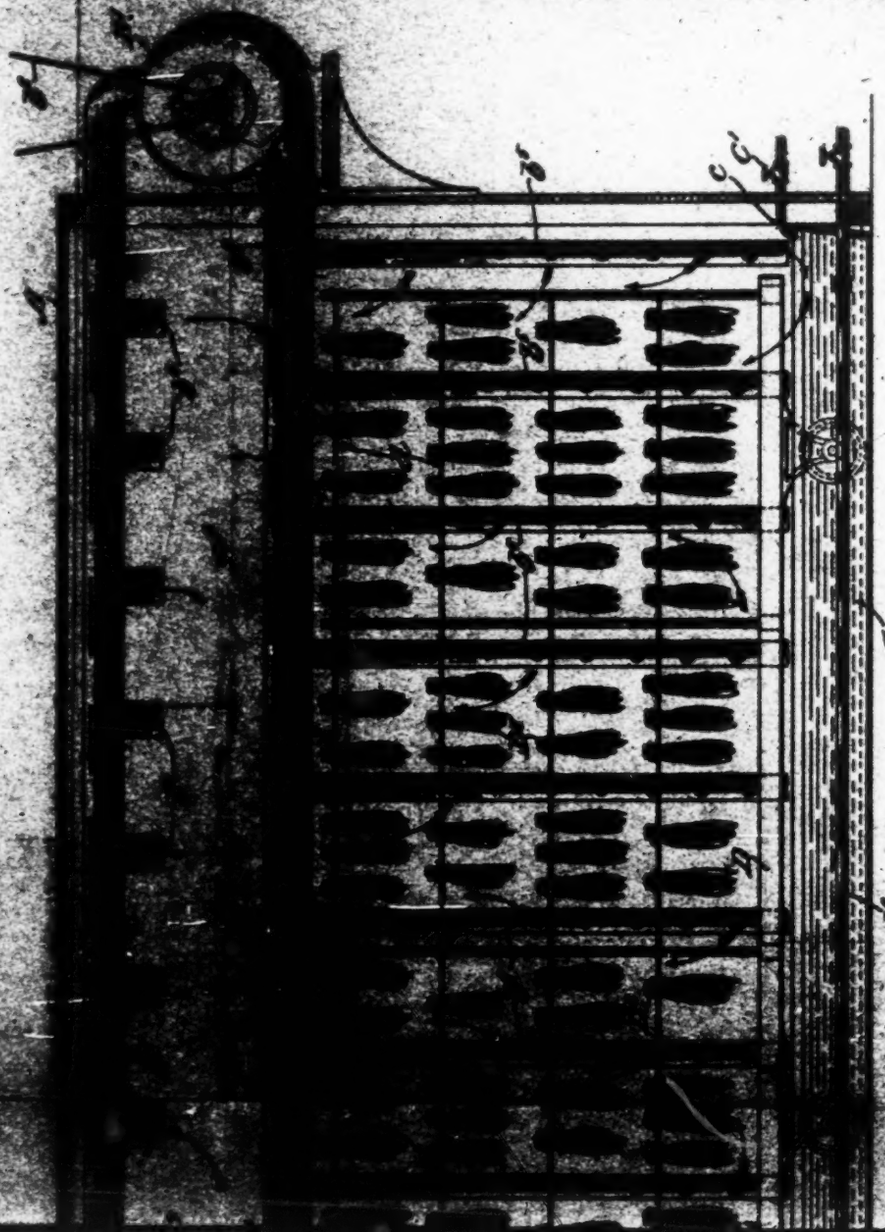
Inventor:
Charles H. Schmaltz Jr.,
by J. Walter Douglas.
Attorney.

(No Model.) 6 Sheets—Sheet 4.

C. W. SCHWARTZ, Jr.

METHOD OF AND APPARATUS FOR ORDERING TOBACCO.

No. 535,175. Patented Mar. 5, 1895.



No. 534,115. Patented Mar. 5, 1895.

Witnesses
Thomas H. Russell
Richard E. Thomas

Inventor
Charles M. Schmutz Jr.
by Wilkie Douglass
Attorneys

1062

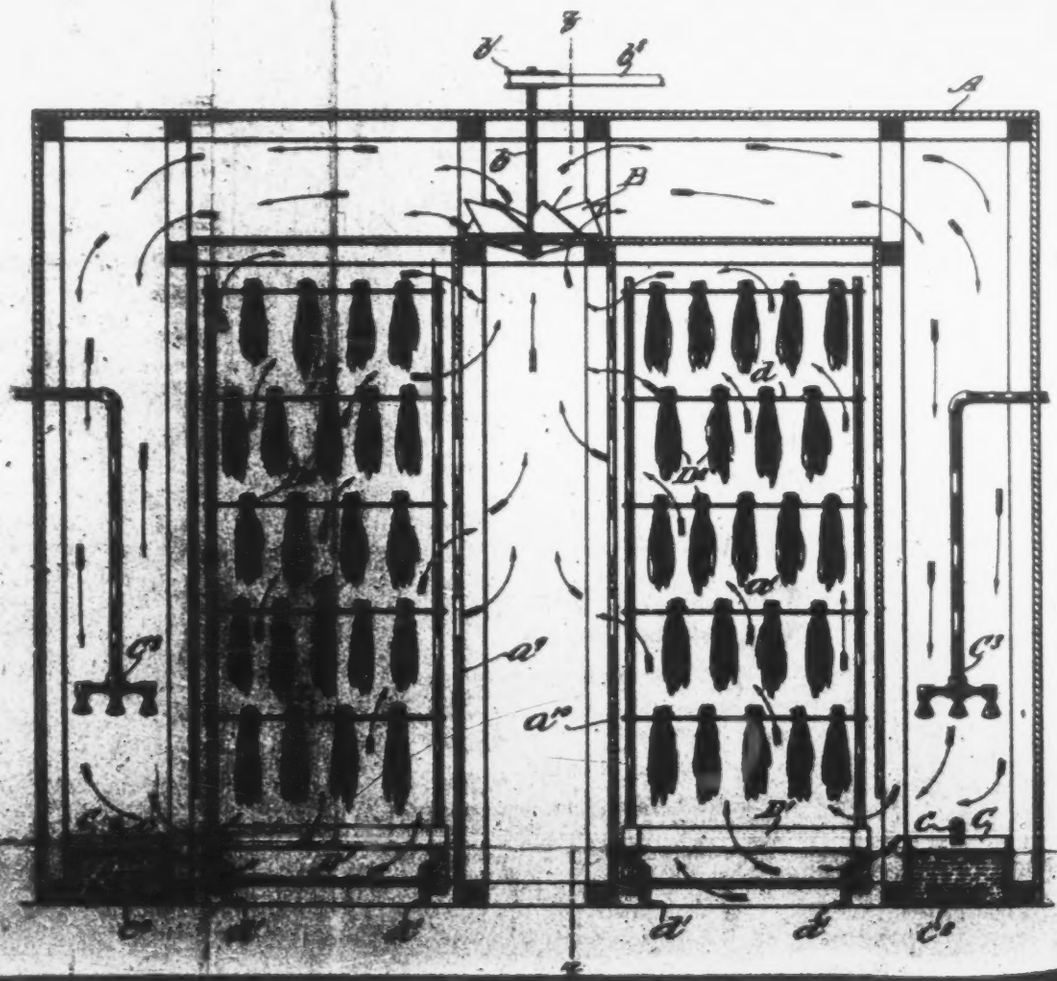
(No Model.) 6 Sheets—Sheet 5.

C. W. SCHWARTZ, Jr.

METHOD OF AND APPARATUS FOR ORDERING TOBACCO.

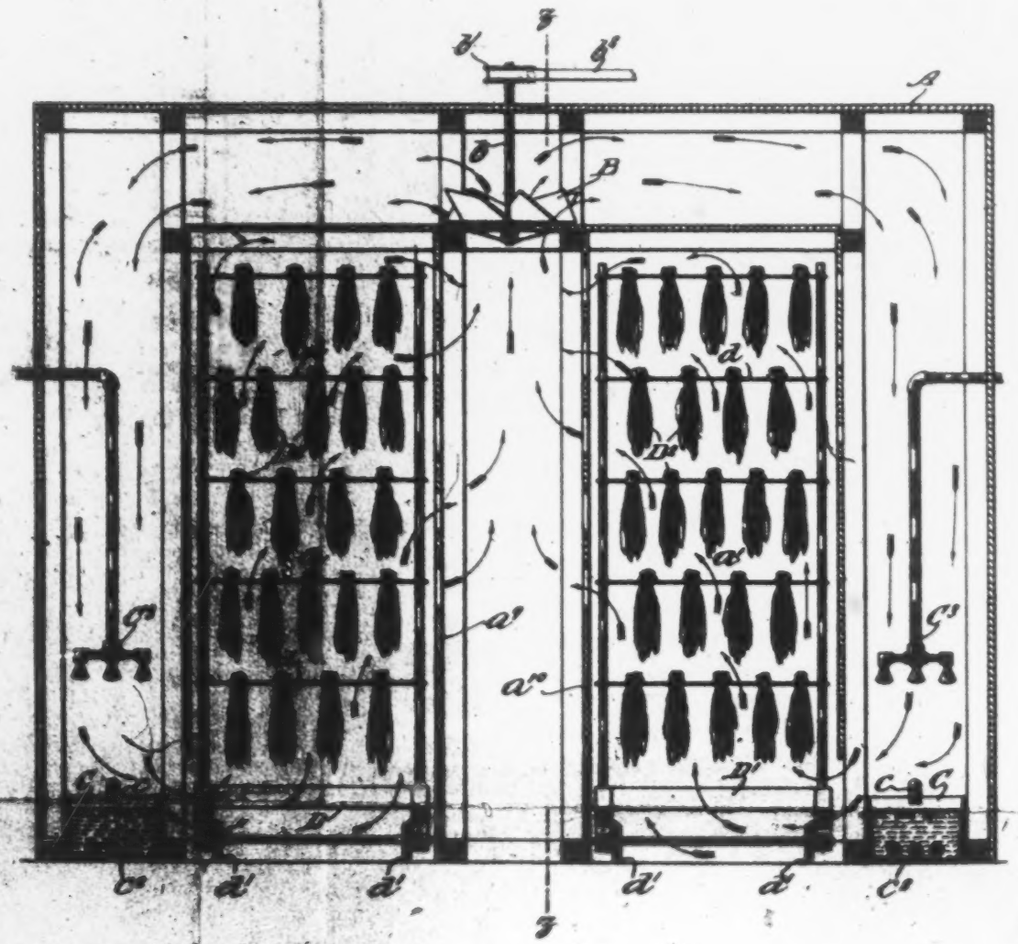
No. 536,175. Patented Mar. 5, 1895.

Fig. 5



No. 535,175. Patented Mar. 5, 1895.

Fig. 5



Witnesses:
Thomas M. Smith.
Richard C. Mauzé.

Inventor:
Charles H. Schumacher Jr.
By J. Walter Coughlin.
Attorney.

1063

(No Model.) 6 Sheets—Sheet 6.

C. W. SCHWARTZ, Jr.

METHOD OF AND APPARATUS FOR ORDERING TOBACCO.

No. 535,175. Patented Mar. 5, 1895.

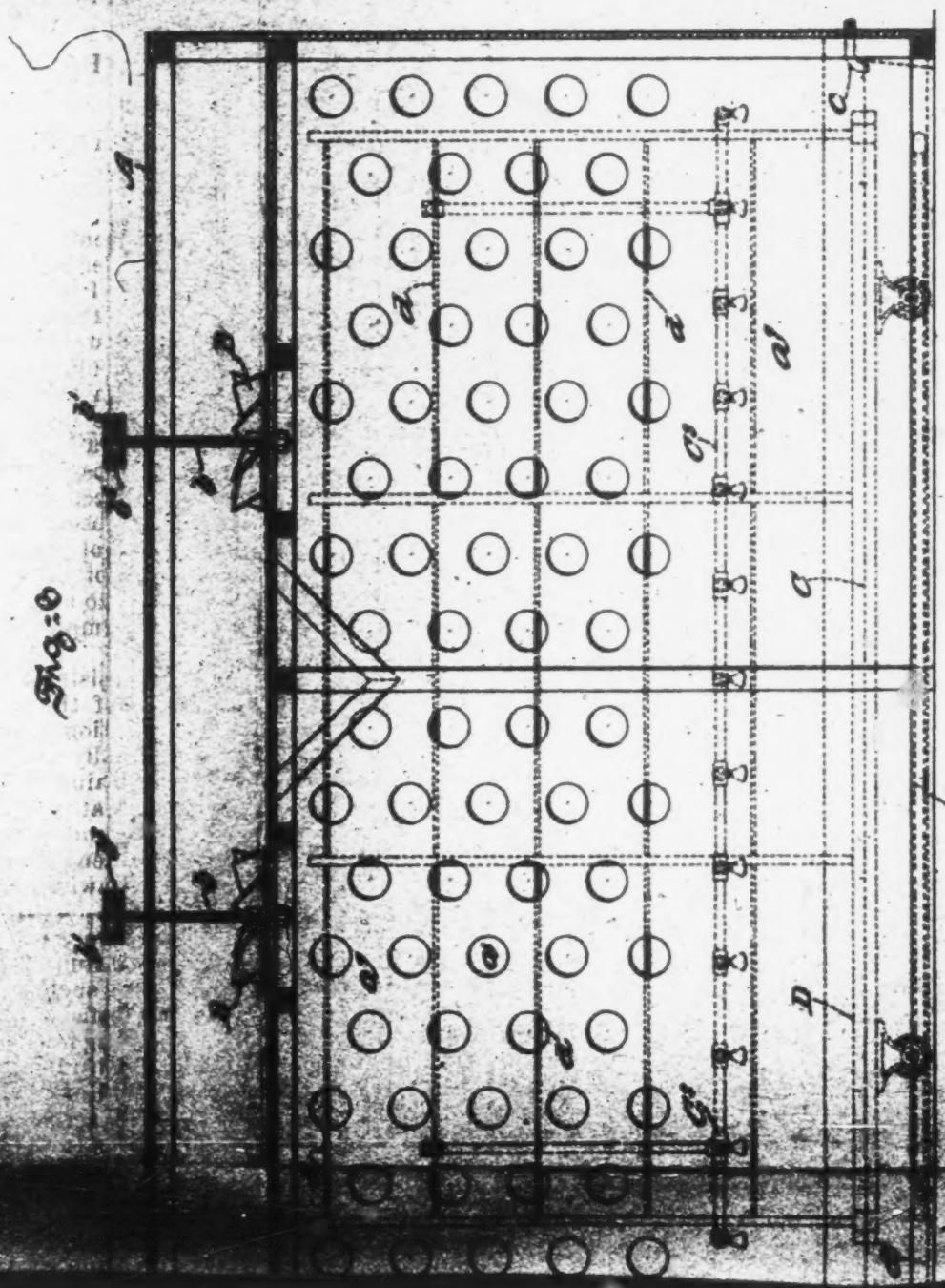


Fig. 9.

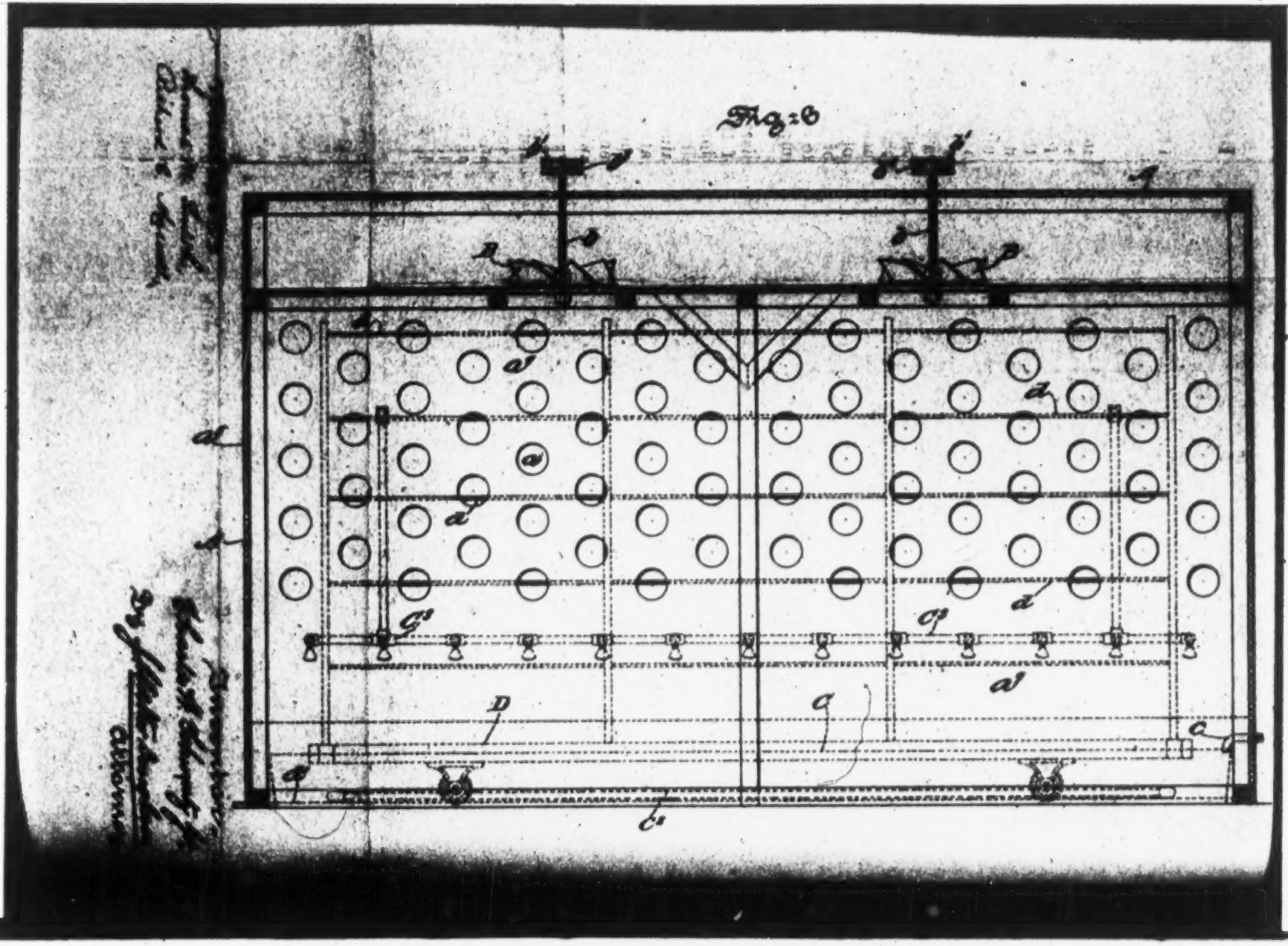


Fig: 6
D

UNITED STATES PATENT OFFICE.

CHARLES W. SCHWARTZ, JR., OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE PHILADELPHIA TEXTILE MACHINERY COMPANY, OF SAME PLACE.

METHOD OF AND APPARATUS FOR ORDERING TOBACCO.

SPECIFICATION forming part of Letters Patent No. 535,175, dated March 5, 1895.

Application filed November 6, 1894. Serial No. 527,941. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. SCHWARTZ, Jr., a citizen of the United States, residing at Germantown, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Methods of and Apparatus for Ordering Tobacco, of which the following is a specification.

My invention relates to a method of and apparatus for ordering tobacco.

The principal objects of my invention are, first, to provide a simple and effective method of hastening the ordering of tobacco so that any tendency to scorching or scalding of the same is entirely prevented and the tobacco rendered sweet in taste and subsequent handling permitted with perfect safety and without fear of crushing the leaves thereof; second, to provide an efficient method of ordering tobacco by circulation and recirculation, which consists in presenting air of one temperature to water of a different temperature in a chamber to cause the latter to be combined so as to produce a humid atmosphere which is forced into the presence of the tobacco absorbing the humidity of the air and again conveying the same into the presence of water to revivify the same and presenting to the tobacco to effect the complete ordering thereof, and, third, to provide suitable apparatus for the conduct of the method of ordering tobacco of my invention.

My invention stated in general terms comprises a method of ordering tobacco by circulation and recirculation which consists in [illegible] of one temperature in the path of [illegible] a different temperature to produce a humid atmosphere and presenting to and [illegible] in such manner as to cause the absorption of the humidity of the air thereby and conveying the air deprived of its humidity to water to supply the same with humidity therefrom, then presenting to water to revivify the same and under pressure forcing again into the presence of the tobacco to effect the complete ordering thereof.

My invention further consists of the method of ordering tobacco by circulation and recirculation, which consists in subjecting air brought to a low temperature into the presence of water maintained at a high temperature to produce a humid atmosphere and presenting continuously to tobacco and successively to water to permit of absorption in the one instance by the tobacco of the humidity of the air and in the other of the supply of the air with humidity so as to again present to the tobacco to effect the complete ordering thereof.

My invention further consists of suitable apparatus for the conduct of the method of ordering tobacco of my invention, constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and general features of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1, is a central vertical section through one form of apparatus embodying features of my invention, and such as in practice has been found well adapted for the conduct of the method of ordering tobacco of my invention. Fig. 2, is a longitudinal section through the apparatus on the line *x*—*x*, of Fig. 1. Fig. 3, is a vertical central section through a modified form of apparatus to that of Fig. 1, for carrying into effect the method of my invention. Fig. 4, is a vertical longitudinal section on the line *y*—*y*, of Fig. 3. Fig. 5, is a vertical central section through a still further modified form of apparatus of my invention; and Fig. 6, is a vertical longitudinal section on the line *z*—*z*, of Fig. 5.

METHOD OF AND APPARATUS FOR ORDERING TOBACCO.

SPECIFICATION forming part of Letters Patent No. 535,175, dated March 5, 1895.

Application filed November 6, 1894. Serial No. 528,041. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. SCHWARTZ, Jr., a citizen of the United States, residing at Germantown, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Methods of and Apparatus for Ordering Tobacco, of which the following is a specification.

My invention relates to a method of and apparatus for ordering tobacco.

The principal objects of my invention are, first, to provide a simple and effective method of hastening the ordering of tobacco so that any tendency to scorching or scalding of the same is entirely prevented and the tobacco rendered sweet in taste and subsequent handling permitted with perfect safety and without fear of crushing the leaves thereof; second, to provide an efficient method of ordering tobacco by circulation and recirculation, which consists in presenting air of one temperature to water of a different temperature in a chamber to cause the latter to be combined so as to produce a humid atmosphere which is forced into the presence of the tobacco absorbing the humidity of the air and again conveying the same into the presence of water to revivify the same and presenting to the tobacco to effect the complete ordering thereof, and, third, to provide suitable apparatus for the conduct of the method of ordering tobacco of my invention.

My invention stated in general terms comprises a method of ordering tobacco by circulation and recirculation which consists in presenting air of one temperature in the path of water of a different temperature to produce a humid atmosphere and presenting to suspended tobacco in such manner as to cause an absorption of the humidity of the air thereby and conveying the air deprived of its humidity to water to supply the same with humidity and presenting again to the tobacco to effect complete or thorough ordering of the same.

My invention further consists in the method of ordering tobacco, of forcing air of one temperature into the presence of water of higher temperature to produce a humid atmosphere and presenting to tobacco, which absorbs humidity therefrom, then presenting to water to revivify the same and under pressure forcing again into the presence of the tobacco to effect the complete ordering thereof.

My invention further consists of the method of ordering tobacco by circulation and recirculation, which consists in subjecting air brought to a low temperature into the presence of water maintained at a high temperature to produce a humid atmosphere and presenting continuously to tobacco and successively to water to permit of absorption in the one instance by the tobacco of the humidity of the air and in the other of the supply of the air with humidity so as to again present to the tobacco to effect the complete ordering thereof.

My invention further consists of suitable apparatus for the conduct of the method of ordering tobacco of my invention, constructed and arranged in substantially the manner hereinafter described and claimed.

The nature and general features of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, and in which—

Figure 1, is a central vertical section through one form of apparatus embodying features of my invention, and such as in practice has been found well adapted for the conduct of the method of ordering tobacco of my invention. Fig. 2, is a longitudinal section through the apparatus on the line x—x, of Fig. 1. Fig. 3, is a vertical central section through a modified form of apparatus to that of Fig. 1, for carrying into effect the method of my invention. Fig. 4, is a vertical longitudinal section on the line y—y, of Fig. 3. Fig. 5, is a vertical central section through a still further modified form of apparatus of my invention; and Fig. 6, is a vertical longitudinal section on the line z—z, of Fig. 5.

Referring to the drawings *A*, is a housing provided with internal chambers *a* and *a'*, partially separated from each other by a partition a^2, with reference to Figs. 1 and 2, of the drawings. In the partition a^2, at the upper portion thereof is provided an opening, into which is mounted a propeller fan or agi-

tating device B, mounted on a cross shaft b which extends through the housing A, and carries a pulley b', and a belt b^2, for effecting the rotation of the said fan or agitating device B.

a^2, is an opening in the lower portion of said partition a^2, for a purpose to be presently explained.

In the bottom of the chamber a, is mounted an oblong trough or tank C, adapted to contain water introduced into the same by means of a spigot c, having a stop-cock c'. In the bottom of the trough or tank C, is provided a coiled pipe c^2, for heating the water therein in such manner as that the same will be maintained at a higher temperature than the air caused to circulate around or about the water of this trough C. Above the tank or trough C, is provided a cooling or refrigerating coiled or other appliance C', for reducing the temperature of the air caused to circulate in the chambers of the housing A, and so that it may be maintained at such a temperature as to intimately blend or combine with the water of a higher temperature traveling in the path thereof and thereby producing the required humid atmosphere for presenting by circulation and recirculation to the tobacco to be absorbed by it in whole or in part to dampen and order the same.

D, is a truck adapted to be introduced into the chamber a', and provided with cross rods d, for supporting bunches of tobacco D^2, therefrom.

d', are rails over which the truck is moved into and out of the housing A, through a door a^3, provided in one of the side or end walls of the same.

In the operation of the apparatus of Figs. 1 and 2, the air is forced by means of the propeller or agitating device B, into the chamber a, and the temperature of the water in the chamber a, being raised by means of the steam coil c^2, so as to raise the air therein freed from the agitating influence of said device D, and in a more or less calm state, will be brought to and maintained at a lower temperature than the water by the cooling or refrigerating appliance C', in the chamber a', and until it is caused to [illegible] with the water to produce a humid [illegible] in the chamber a, of the housing A, and when after the starting up of the apparatus is continuously continued through the chambers a and a', into the presence of the tobacco D^2, in the latter chamber a', and

With reference to Figs. 3 and 4, the apparatus is substantially the same as that of Figs. 1 and 2, with the following exceptions:—The blowing or agitating device B', in the present instance, is provided with a transverse conduit b^3, extending substantially the width of the housing A, and connected therewith are longitudinal pipes or conduits b^4, on each side provided with depending perforated pipes b^5, as clearly illustrated in Fig. 4. Within the housing A, are mounted two trucks D and D', on rails d', secured to the floor thereof, and with a water tank or trough C, located in a central chamber a^2, and having a heating coil extending through the tank or trough for not only heating, but also maintaining the water therein at a different temperature from that of air caused to circulate through the internal chambers of the housing A, and becoming associated with the water to produce a humid atmosphere, for being presented to the tobacco in bunch or other form suspended from the trucks D and D', as fully illustrated in Fig. 3.

b^7, is a pipe or conduit located beneath the roof of the housing on the inside thereof and connected with the rear of the blowing device B'. This pipe or conduit b^7, is provided with a series of depending inlets b^8, and at the left hand end thereof is provided a large inlet or throat b^9, for sucking air into the same deprived of its moisture or humidity through its absorption by the tobacco and which air is also drawn through the series of inlets b^8, of said conduit b^7, thereby and conducted rearwardly into the blowing device B', and by which latter means the air is again conveyed through the transverse conduit b^3, and then longitudinally and downwardly through the perforated depending pipes or conduits b^4 and b^5, in such manner as that the presence of the air of one temperature from said perforated pipes b^5, on both sides of the interior of the housing, then in a more or less calm state or condition, will be brought into the path of water in the tank or vat C, of a different temperature, thereby receiving moisture therefrom and thus converting the air into a humid atmosphere which is presented by circulation and recirculation to the tobacco suspended from the trucks D and D' to effect first moistening of the body or surface of the tobacco and then complete ordering of the same.

It may be here remarked that the cooling or

In the bottom of the chamber a, is mounted an oblong trough or tank C, adapted to contain water introduced into the same by means of a spigot c, having a stop-cock c'. In the bottom of the trough or tank C, is provided a coiled pipe c^2, for heating the water therein in such manner as that the same will be maintained at a higher temperature than the air caused to circulate around or about the water of this trough C. Above the tank or trough C, is provided a cooling or refrigerating coiled or other appliance C', for reducing the temperature of the air caused to circulate in the chambers of the housing A, and so that it may be maintained at such a temperature as to intimately blend or combine with the water of a higher temperature traveling in the path thereof and thereby producing the required humid atmosphere for presenting by circulation and recirculation to the tobacco to be absorbed by it in whole or in part to dampen and order the same.

D, is a truck adapted to be introduced into the chamber a', and provided with cross rods d, for supporting bunches of tobacco D^2, therefrom.

d', are rails over which the truck is moved into and out of the housing A, through a door a^3, provided in one of the side or end walls of the same.

In the operation of the apparatus of Figs. 1 and 2, the air is forced by means of the propeller or agitating device B, into the chamber a, and the temperature of the water in the chamber a, being raised by means of the steam coil c^2, so as to cause the air therein freed from the agitating influence of said device D, and in a more or less calm state and brought to and maintained at a lower temperature than the water by the cooling or refrigerating appliance C', in the chamber a', and until it is caused to associate with the water to produce a humid atmosphere in the chamber a, of the housing A, and which after the starting up of the apparatus is continuously conducted through the chambers a and a', into the presence of the tobacco D^2, in the latter chamber a', and the humidity of the air is absorbed by the tobacco suspended from the truck D, therein and under the influence of the propeller fan or agitating device B, the air having the humidity dissociated therefrom is carried back again into the chamber a, where it becomes again a humid atmosphere and is conveyed into the presence of the tobacco to effect first the moistening or dampening of the surface or body thereof and by continuous circulation and recirculation of the air supplied with moisture, complete ordering of the tobacco.

provided with depending perforated pipes, as clearly illustrated in Fig. 4. Within the housing A, are mounted two trucks D and D', on rails d', secured to the floor thereof, and with a water tank or trough C, located in a central chamber a^3, and having a heating coil extending through the tank or trough for not only heating, but also maintaining the water therein at a different temperature from that of air caused to circulate through the internal chambers of the housing A, and becoming associated with the water to produce a humid atmosphere, for being presented to the tobacco in bunch or other form suspended from the trucks D and D', as fully illustrated in Fig. 3.

b^7, is a pipe or conduit located beneath the roof of the housing on the inside thereof and connected with the rear of the blowing device B'. This pipe or conduit b^7, is provided with a series of depending inlets b^8, and at the left hand end thereof is provided a large inlet or throat b^9, for sucking air into the same deprived of its moisture or humidity through its absorption by the tobacco and which air is also drawn through the series of inlets b^8, of said conduit b^7, thereby and conducted rearwardly into the blowing device B', and by which latter means the air is again conveyed through the transverse conduit b^5, and then longitudinally and downwardly through the perforated depending pipes or conduits b^4 and b^6, in such manner as that the presence of the air of one temperature from said perforated pipes b^6, on both sides of the interior of the housing, then in a more or less calm state or condition, will be brought into the path of water in the tank or vat C, of a different temperature, thereby receiving moisture therefrom and thus converting the air into a humid atmosphere which is presented by circulation and recirculation to the tobacco suspended from the trucks D and D', to effect first moistening of the body or surface of the tobacco and then complete ordering of the same.

It may be here remarked that the cooling or refrigerating appliance may be in the nature of a sprayer or any other somewhat similar means to be further explained to reduce the temperature of air circulating in and about the interior of the housing below the temperature of the heated water of the tank or trough C.

With reference to Figs. 5 and 6, the apparatus therein differs from that hereinbefore described in the following particulars:—Instead of providing on the interior of the housing A, a series of depending perforated tubes

b^7, connected with pipes or conduits b^4, and with a main conduit b^5, in which air is conducted therethrough by means of a blowing device B', propeller fans B, as illustrated in Figs. 1 and 2, are employed in the top of the housing and the air is forced therefrom and thereby in different directions as indicated by the arrows in Fig. 5, and in a more or less calm state by this time, into the presence of water maintained at a different temperature from the air, so that the latter may effectually absorb the water and thus create a humid atmosphere for presenting to the tobacco supported from the trucks D and D', in the chambers a and a', which are separated from each other by means of partitions a^9 and a^{10}. These partitions are provided with staggered openings, as clearly illustrated in Fig. 5. The cooling or refrigerating appliance for reducing the temperature of circulating air in this instance is in the nature of a water sprayer or atomizer c^3, as fully illustrated in Figs. 5 and 6. In other respects the apparatus is the same as that hereinbefore fully explained and the devices associated with the apparatus operate in the same manner as they do with reference to Figs. 1 to 4, of the drawings.

It will be manifestly obvious to those skilled in the art to which my invention appertains that still further modifications as to details of construction of the apparatus and arrangement of the devices connected therewith may be made, without departing from the spirit and scope thereof; and hence I do not wish to be understood as limiting myself to the precise arrangements of all the parts of the apparatus as illustrated; but

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The method of ordering tobacco, which consists in continuously presenting air of one temperature in a chamber to water of another temperature to produce a humid atmosphere, conveying the same into the presence of tobacco to effect dampening thereof, and causing successively the air deprived of its humidity to be revivified and again presented to the tobacco to effect ordering thereof, substantially as described.

2. The method of ordering tobacco, which consists in forcing air into the presence of water of a temperature differing from the air to become associated therewith by producing a humid atmosphere, conveying the same to tobacco which absorbs the humidity thereof, conducting the air deprived of its humidity [illegible] to revivify the same and then ing the same to tobacco, reconveying into the presence of water and presenting again to the tobacco to effect ordering thereof, substantially as described.

4. The method of ordering tobacco, which consists in presenting air artificially lowered in temperature in the path of heated water to cause association of one with the other so as to produce a humid atmosphere which is presented to tobacco, successively revivifying the air deprived of its moisture by the absorption of the same by the tobacco and recirculating the same through the tobacco, substantially as and for the purposes described.

5. The method of ordering tobacco, which consists in presenting air artificially changed as to its temperature beyond the point of agitation thereof to water maintained at a different temperature and by association of one with the other producing a humid atmosphere, continuously presenting to tobacco and successively revivifying the same deprived of its humidity through its absorption by the tobacco and again presenting thereto, substantially as and for the purposes described.

6. An apparatus for ordering tobacco, comprising a housing provided with a water tank or trough having means for heating said water, a cooling or refrigerating appliance, and a blowing or forcing device for circulating and recirculating air in the path of the water of said tank or trough, substantially as and for the purposes described.

7. An apparatus for ordering tobacco, comprising a housing provided with two communicating chambers, a blowing or forcing device for circulating and recirculating air, a water tank or trough provided with a heating device, and means for supporting tobacco in said housing, substantially as and for the purposes described.

8. An apparatus for ordering tobacco, comprising a housing provided with means adapted to contain water and maintain the same at a different temperature from that of the air therein, means for circulating and recirculating the air through said housing, and means for supporting tobacco in said housing and subjecting the same to the influence of the generated humid atmosphere therein, substantially as and for the purposes described.

9. An apparatus for ordering tobacco, comprising a housing having internal chambers, means for containing water in one of said chambers and a cooling appliance, means for circulating and recirculating the air through said housing in each instance anterior to its being presented to the water, and means for supporting tobacco in the other chamber of

presence of water maintained at a different temperature from the air, so that the latter may effectually absorb the water and thus create a humid atmosphere for presenting to the tobacco supported from the trucks D and D', in the chambers a and a', which are separated from each other by means of partitions a^9 and a^{10}. These partitions are provided with staggered openings, as clearly illustrated in Fig. 5. The cooling or refrigerating appliance for reducing the temperature of circulating air in this instance is in the nature of a water sprayer or atomizer c^3, as fully illustrated in Figs. 5 and 6. In other respects the apparatus is the same as that hereinbefore fully explained and the devices associated with the apparatus operate in the same manner as they do with reference to Figs. 1 to 4, of the drawings.

It will be manifestly obvious to those skilled in the art to which my invention appertains that still further modifications as to details of construction of the apparatus and arrangement of the devices connected therewith may be made, without departing from the spirit and scope thereof; and hence I do not wish to be understood as limiting myself to the precise arrangements of all the parts of the apparatus as illustrated; but

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The method of ordering tobacco, which consists in continuously presenting air of one temperature in a chamber to water of another temperature to produce a humid atmosphere, conveying the same into the presence of tobacco to effect dampening thereof, and causing successively the air deprived of its humidity to be revivified and again presented to the tobacco to effect ordering thereof, substantially as described.

2. The method of ordering tobacco, which consists in forcing air into the presence of water of a temperature differing from the air to become associated therewith by producing a humid atmosphere, conveying the same to tobacco which absorbs the humidity thereof, conducting the air deprived of its humidity to the water to revivify the same and then presenting the air recharged with moisture to the tobacco to effect ordering thereof, substantially as described.

3. The method of ordering tobacco, which consists in presenting under pressure air of a low temperature to water of a high temperature to create a humid atmosphere, conveying presented to tobacco, successively revivifying the air deprived of its moisture by the absorption of the same by the tobacco and recirculating the same through the tobacco, substantially as and for the purposes described.

5. The method of ordering tobacco, which consists in presenting air artificially changed as to its temperature beyond the point of agitation thereof to water maintained at a different temperature and by association of one with the other producing a humid atmosphere, continuously presenting to tobacco and successively revivifying the same deprived of its humidity through its absorption by the tobacco and again presenting thereto, substantially as and for the purposes described.

6. An apparatus for ordering tobacco, comprising a housing provided with a water tank or trough having means for heating said water, a cooling or refrigerating appliance, and a blowing or forcing device for circulating and recirculating air in the path of the water of said tank or trough, substantially as and for the purposes described.

7. An apparatus for ordering tobacco, comprising a housing provided with two communicating chambers, a blowing or forcing device for circulating and recirculating air, a water tank or trough provided with a heating device, and means for supporting tobacco in said housing, substantially as and for the purposes described.

8. An apparatus for ordering tobacco, comprising a housing provided with means adapted to contain water and maintain the same at a different temperature from that of the air therein, means for circulating and recirculating the air through said housing, and means for supporting tobacco in said housing and subjecting the same to the influence of the generated humid atmosphere therein, substantially as and for the purposes described.

9. An apparatus for ordering tobacco, comprising a housing having internal chambers, means for containing water in one of said chambers and a cooling appliance, means for circulating and recirculating the air through said housing in each instance anterior to its being presented to the water, and means for supporting tobacco in the other chamber of said housing, substantially as and for the purposes described.

10. An apparatus for ordering tobacco, comprising a housing divided into internal communicating chambers having openings in the partitions thereof, a water trough or vats with heating means therein, a forcing or blowing

device for circulating and recirculating air within said housing, means for supporting tobacco in one of said internal chambers, and means for heating the air located in the other of said chambers, substantially as and for the purposes described.

In witness whereof I have hereunto set my signature in the presence of two subscribing witnesses.

CHARLES W. SCHWARTZ, JR.

Witnesses:
THOMAS M. SMITH,
RICHARD C. MAXWELL.

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(No Model.) 3 Sheets—Sheet 1.

J. K. PROCTOR.

APPARATUS FOR ORDERING TOBACCO.

No. 553,723. Patented Jan. 28, 1896.

Fig: 1

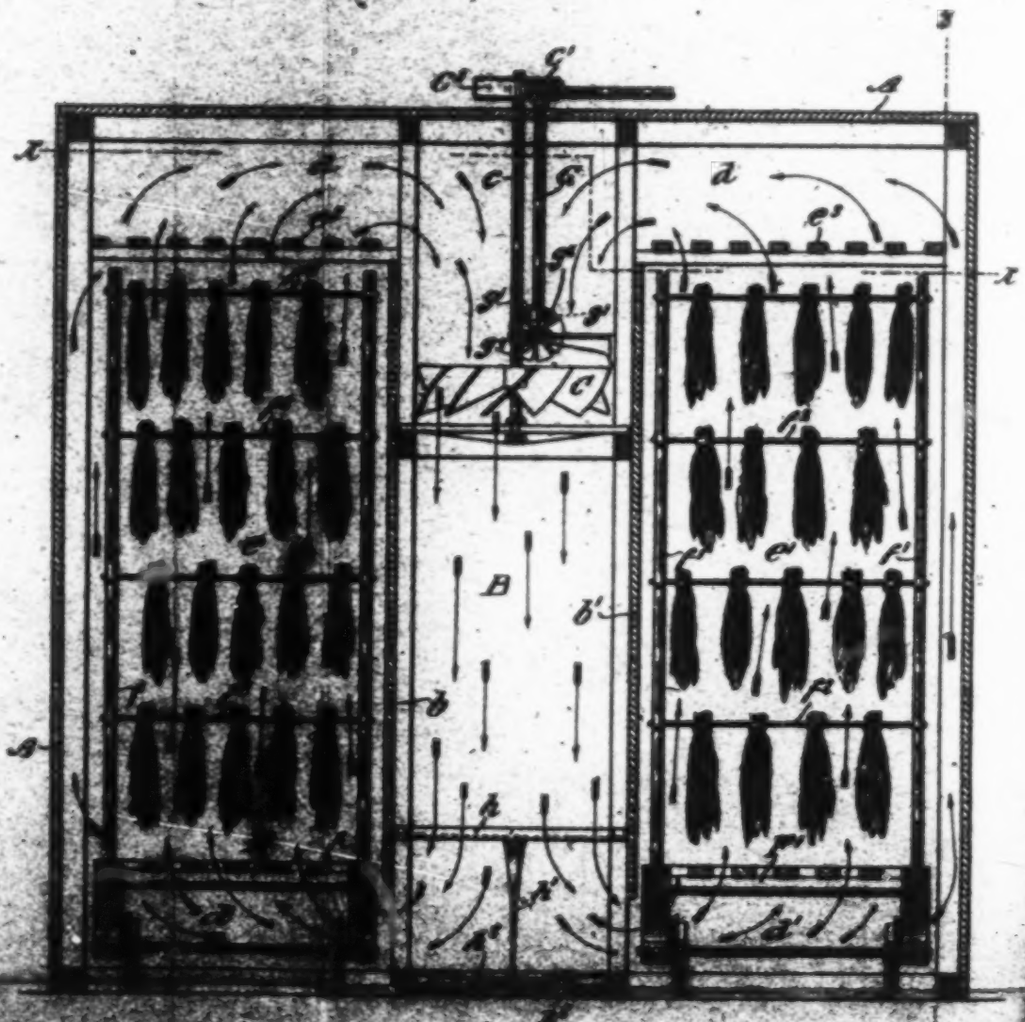
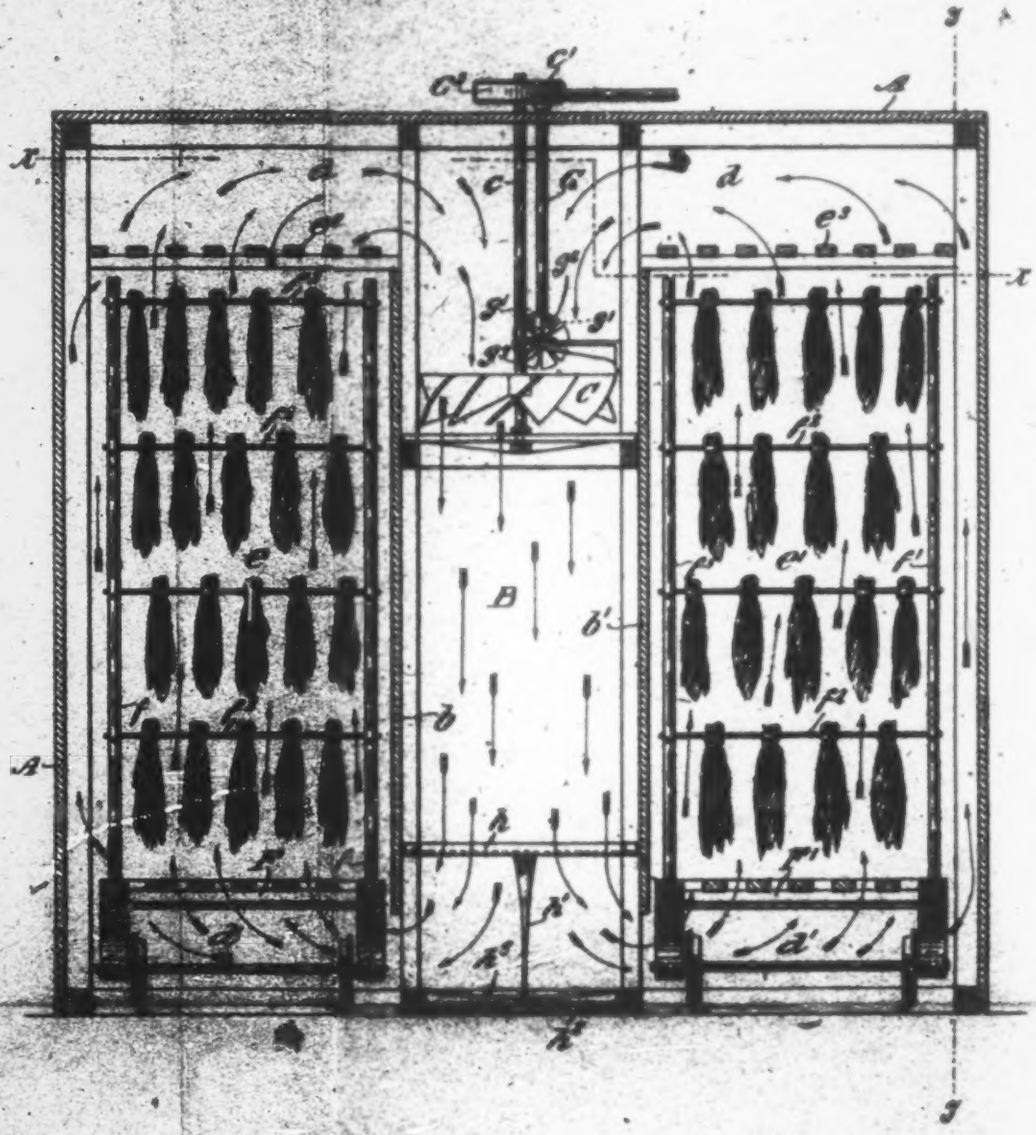


Fig: 1



Witnesses:
Richard S. Maxwell,
Thomas M. Smith

Inventor.
Josiah K. Porter,
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Attorneys.

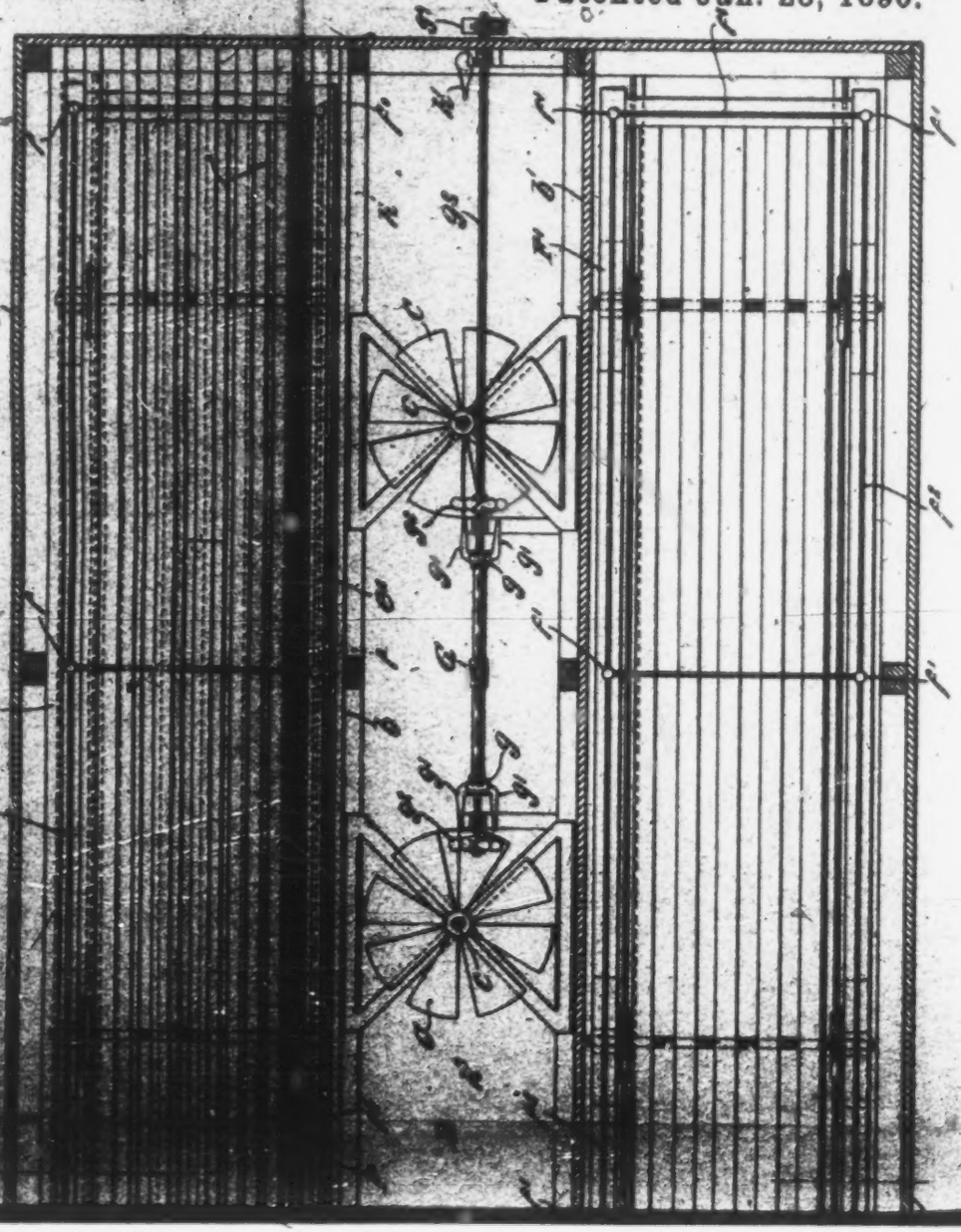
1069

(No Model.) 3 Sheets—Sheet 2.

J. K. PROCTOR.

APPARATUS FOR ORDERING TOBACCO.

No. 553,723. Patented Jan. 28, 1896.



No. 473,121. Patented Jan. 26, 1892.

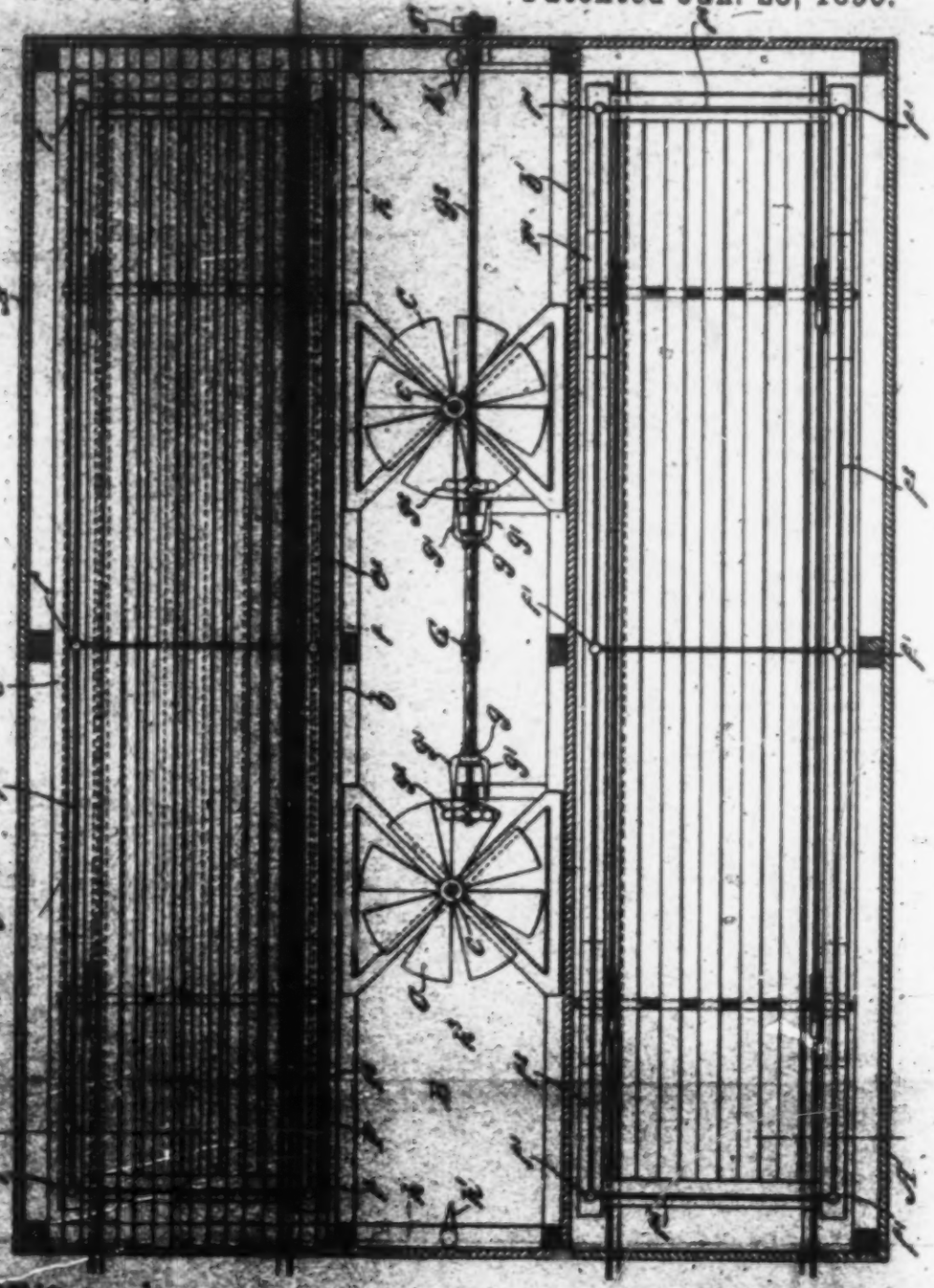


Fig. 2.

Witnesses:
Robert F. Russell
Emma M. Lee

Inventor:
Josiah K. Porter,
by Elliott & Hughes
Attorneys.

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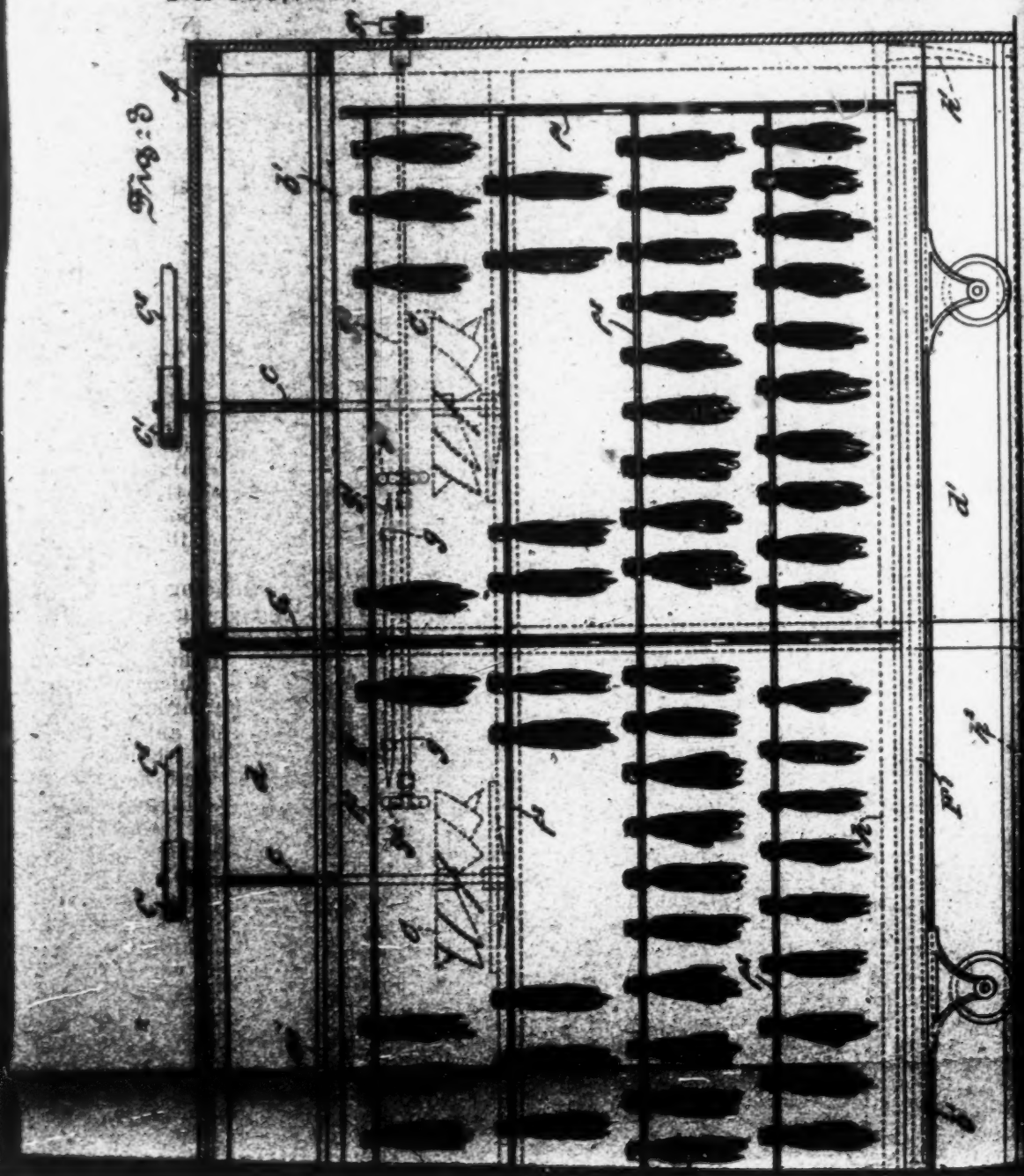
(No Model.) 3 Sheets—Sheet 3.

J. K. PROCTOR.

APPARATUS FOR ORDERING TOBACCO.

No. 553,723. Patented Jan. 28, 1896.



No. 555,783. Patented Mar. 10, 1896.

Fig. 3.

Witnesses:

Josiah K. Porter

By

Attorney

UNITED STATES PATENT OFFICE.

JOSIAH K. PROCTOR, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE PHILADELPHIA TEXTILE MACHINERY COMPANY, OF SAME PLACE.

APPARATUS FOR ORDERING TOBACCO.

SPECIFICATION forming part of Letters Patent No. 553,723, dated January 28, 1896.

Application filed September 6, 1894. Serial No. 522,241. (No model.)

To all whom it may concern:

Be it known that I, JOSIAH K. PROCTOR, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Ordering Tobacco, of which the following is a specification.

My invention has relation to apparatus for ordering tobacco.

The principal object of my invention is to provide an apparatus for hastening the ordering of tobacco by preventing any tendency to scorching or scalding thereof, and thereby to render the tobacco sweet in taste, and so conducting the ordering as to permit of the subsequent handling of the same with perfect safety and without fear of crushing the leaf.

My invention consists of an apparatus adapted for ordering tobacco, substantially as hereinafter described and claimed.

The nature and general features of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a vertical sectional view through an apparatus embodying features of my invention and such as in practice have been found well adapted for the ordering of tobacco according to my invention. Fig. 2 is a [illegible] view on the line *x x* of Fig. 1 with the [illegible] housing removed; and Fig. 3 is a [illegible] cross-sectional view on the line *y y* of Fig. 1, showing the internal arrangement of certain of the compartments or communicating chambers of the apparatus of my invention.

Referring to the drawings, A is a housing of any suitable shape or form.

[illegible] partitions forming the walls of a vertical central open top and bottom chamber [illegible] provided with fans or agitating devices [illegible] mounted on shaft *c* therein, which consisting of slats or strips e^3 and e^3 at the top, and by movable barriers such as slatted frames or trucks F and F' at the bottom. These frames or trucks are provided with uprights or supports *f* and *f'* and with a series of cross-rods f^2 for suspending therefrom bundles of tobacco in the chambers *e* and *e'*. These chambers *e* and *e'* are arranged so that a direct communication is established with the cross-chambers *d* and *d'* through the openings or slits in the top and bottom of said chambers *e* and *e'*, as clearly illustrated in Fig. 1 of the drawings.

G is a water-supply extending downward through the top of the housing A and provided with a T-branch *g*, having tapering ends or nozzles *g'*, arranged in the path of rotatable agitators or fans g^3, which are supported on a shaft g^3, rotated through a pulley g^4 by means of a belt from any suitable source of power, (not shown,) whereby the water in its passage through the branch pipe *g* of the supply G is discharged in the form of a fine spray into the presence of the air in the central chamber B and caused thereby to circulate, under the vigorous agitation of the fans C, continuously through the series of internal chambers of the housing A, induced by suction, so as to give off the humidity created in the air to the tobacco, which is absorbed thereby on all sides or surfaces thereof, not only to dampen the same, but also to completely effect the uniform ordering thereof.

It may be here remarked that tobacco has an affinity for humid air, and the conditions and arrangements of the internal parts of the apparatus as above explained are such that most satisfactory results are obtained in the ordering, and in consequence subsequent working of the tobacco can be readily effected without fear of the crushing or crumbling of the same. It may be further remarked that the slatted roof and bottom of each of the chambers *e* and *e'* afford the means whereby

APPARATUS FOR ORDERING TOBACCO.

SPECIFICATION forming part of Letters Patent No. 553,723, dated January 28, 1896.

Application filed September 6, 1894. Serial No. 522,241. (No model.)

To all whom it may concern:

Be it known that I, JOSIAH K. PROCTOR, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Ordering Tobacco, of which the following is a specification.

My invention has relation to apparatus for ordering tobacco.

The principal object of my invention is to provide an apparatus for hastening the ordering of tobacco by preventing any tendency to scorching or scalding thereof, and thereby to render the tobacco sweet in taste, and so conducting the ordering as to permit of the subsequent handling of the same with perfect safety and without fear of crushing the leaf.

My invention consists of an apparatus adapted for ordering tobacco, substantially as hereinafter described and claimed.

The nature and general features of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a vertical sectional view through an apparatus embodying features of my invention and such as in practice have been found well adapted for the ordering of tobacco according to my invention. Fig. 2 is a top view on the line x x of Fig. 1 with the top of the housing removed; and Fig. 3 is a vertical cross-sectional view on the line y-y of Fig. 1, showing the internal arrangement of certain of the compartments or communicating chambers of the apparatus of my invention.

Referring to the drawings, A is a housing of any suitable shape or form.

b and b' are partitions forming the walls of a vertical central open top and bottom chamber B, provided with fans or agitating devices C, mounted on shaft c therein, which shafts extend through the top of the housing A and are provided with pulleys c' engaged by belts c^2, which are actuated from any suitable source of power. (Not shown.)

d and d' are top and bottom cross-chambers partially separated from the vertical side chambers e and e' by means of barriers consisting of slats or strips e^2 and e^3 at the top, and by movable barriers such as slatted frames or trucks F and F' at the bottom. These frames or trucks are provided with uprights or supports f and f' and with a series of cross-rods f^2 for suspending therefrom bundles of tobacco in the chambers e and e'. These chambers e and e' are arranged so that a direct communication is established with the cross-chambers d and d' through the openings or slits in the top and bottom of said chambers e and e', as clearly illustrated in Fig. 1 of the drawings.

G is a water-supply extending downward through the top of the housing A and provided with a T-branch g, having tapering ends or nozzles g', arranged in the path of rotatable agitators or fans g^2, which are supported on a shaft g^3, rotated through a pulley g^4 by means of a belt from any suitable source of power, (not shown,) whereby the water in its passage through the branch pipe g of the supply G is discharged in the form of a fine spray into the presence of the air in the central chamber B and caused thereby to circulate, under the vigorous agitation of the fans C, continuously through the series of internal chambers of the housing A, induced by suction, so as to give off the humidity created in the air to the tobacco, which is absorbed thereby on all sides or surfaces thereof, not only to dampen the same, but also to completely effect the uniform ordering thereof.

It may be here remarked that tobacco has an affinity for humid air, and the conditions and arrangements of the internal parts of the apparatus as above explained are such that most satisfactory results are obtained in the ordering, and in consequence subsequent working of the tobacco can be readily effected without fear of the crushing or crumbling of the same. It may be further remarked that the slatted roof and bottom of each of the chambers e and e' afford the means whereby in the passage of the volume of humid air into the presence of the suspended leaf-tobacco it is enabled to momentarily expand and thus thoroughly, as practice has demonstrated, order the tobacco, and the air deprived of its humidity given off to the tobacco and absorbed thereby to a greater or less extent,

under the influence of suction, is successively liberated into the presence of the atomizing and forcing appliances in the central chamber of the apparatus, where it is revivified and again presented in a humid condition to the tobacco to completely order the same. It will be observed that the circulation of the humid air is continuous, and also that it may be made more or less vigorous, according as the speed of the fans or agitating devices C are increased or decreased. Again these devices are the means for forcing the humid air continuously by circulation and recirculation through the apparatus into the presence of the tobacco suspended in certain of the chambers of the apparatus, aided by suction.

The slatted bottom frames or trucks of the apparatus can be removed with the tobacco supported thereon through doors to be provided in the walls of the housing A.

Any water in bead or drop form carried by the air in the central chamber B and thrown against the partitions *b* and *b'* will drip into an annular trough *h* in the lower part thereof, as clearly shown in Fig. 1. This trough *h* may be provided with a strip of burlap or other suitable material h^4, depending therefrom into a pan or drip-receptacle h^3, as clearly illustrated in Fig. 1 of the drawings, and provided with a loose cover or strip of burlap or other absorbent material h^4, spread over the said pan, whereby through capillary attraction beads or drops of water liberated from the air and falling in the mixing and agitating chamber B will ultimately find their way into the pan or drip-receptacle h^3, and may be removed therefrom through an outlet in the bottom of the pan. (Not shown.)

The arrangement of the apparatus described for the carrying out of the invention, as hereinbefore explained, is such as to permit of great uniformity of action of the moist air among and upon the ordered tobacco, so that absorption of the moisture of the air by the tobacco is very evenly accomplished throughout all the tobacco chambers of the apparatus. This was not the case with apparatus heretofore employed, because the [illegible] arrangement and the wetting of the tobacco perfect uniformity of ordering is insured for the reason that all the tobacco is subjected to like currents of humidified air, which remains in uniform condition and contact with the tobacco during the entire period of ordering, and the affinity of the tobacco for such an atmosphere is fully carried out, so that prizing of the same for storage can be effected upon removal from the ordering-compartments without "bulking" or "picking" or the expense incident thereto.

It will be manifestly obvious to those skilled in the art to which my invention appertains, as extended practice thereof has demonstrated, that modifications as to details of construction of the apparatus for carrying out my invention can be made without departing from the spirit or scope of the same.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An apparatus for ordering tobacco, comprising a housing provided with a central chamber within which is created a humid atmosphere by the spraying of water into air, side chambers provided with top and bottom barriers connected with said central chamber so that the humid air conveyed from said central chamber may be absorbed by the tobacco in said side chambers, suction means in said central chamber for causing the air deprived of its humidity to be withdrawn between the top barriers of said chambers and to be presented to an atmosphere adapted to revivify the same in said central chamber and to be conveyed again into the tobacco side chambers to effect uniform ordering thereof, substantially as and for the purposes described.

2. An apparatus for ordering tobacco, comprising a housing provided with a central chamber having agitating and atomizing appliances therein, top and bottom chambers in communication with said central chamber and with side chambers having the roof and bottom of each of them provided with [illegible] and means for actuating said agitating and atomizing appliances so as to cause a circulation and recirculation of humid air [illegible] purposes described.

3. An apparatus for ordering tobacco, comprising a housing provided with a [illegible]

tion to the tobacco to completely order the same. It will be observed that the circulation of the humid air is continuous, and also that it may be made more or less vigorous, according as the speed of the fans or agitating devices C are increased or decreased. Again these devices are the means for forcing the humid air continuously by circulation and recirculation through the apparatus into the presence of the tobacco suspended in certain of the chambers of the apparatus, aided by suction.

The slatted bottom frames or trucks of the apparatus can be removed with the tobacco supported thereon through doors to be provided in the walls of the housing A.

Any water in head or drop form carried by the air in the central chamber B and thrown against the partitions *b* and *b'* will drip into an annular trough *h* in the lower part thereof, as clearly shown in Fig. 1. This trough *h* may be provided with a strip of burlap or other suitable material h^2, depending therefrom into a pan or drip receptacle h^3, as clearly illustrated in Fig. 1 of the drawings, and provided with a loose piece or strip of burlap or other absorbent material h^4, spread over the said pan, whereby through capillary attraction beads or drops of water liberated from the air and falling in the mixing and agitating chamber B will ultimately find their way into the pan or drip receptacle h^3, and may be removed therefrom through an outlet in the bottom of the pan. (Not shown.)

The arrangement of the apparatus described for the carrying out of the invention, as hereinbefore explained, is such as to permit of great uniformity of action of the moist air among and upon the confined tobacco, so that absorption of the moisture of the air by the tobacco is very evenly accomplished throughout in the tobacco chambers of the apparatus. This was not the case with apparatus as heretofore employed, because the [illegible] and thereby [illegible] the tobacco exposed to the influence of the volume of such air with its serious consequence of the rotting of the [illegible] becoming moldy, and thus unsalable or unfit for subsequent use, before removed from the ordering chambers. [illegible] in bulk be "drawn" in order as much as possible by diffusion to bring it to a state of more uniformity, but this [illegible] "prizing" or pressing for the purpose thereof. Again in removing it has been found to be either too wet to be stored or else too dry.

In the practice of the present invention dering, and the [illegible] such an atmosphere is fully carried out, that prizing of the same for storage can be effected upon removal from the ordering-compartments without "bulking" or "picking" or the expense incident thereto.

It will be manifestly obvious to those skilled in the art to which my invention appertains, as extended practice thereof has demonstrated, that modifications as to details of construction of the apparatus for carrying out my invention can be made without departing from the spirit or scope of the same.

Having thus described the nature and objects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An apparatus for ordering tobacco, comprising a housing provided with a central chamber within which is created a humid atmosphere by the spraying of water into air, side chambers provided with top and bottom barriers connected with said central chamber so that the humid air conveyed from said central chamber may be absorbed by the tobacco in said side chambers, suction means in said central chamber for causing the air deprived of its humidity to be withdrawn between the top barriers of said chambers and to be presented to an atmosphere adapted to revivify the same in said central chamber and to be conveyed again into the tobacco side chambers to effect uniform ordering thereof, substantially as and for the purposes described.

2. An apparatus for ordering tobacco, comprising a housing provided with a central chamber having agitating and atomizing appliances therein, top and bottom chambers in communication with said central chamber and with side chambers having the roof and bottom of each of them provided with slots and means for actuating said agitating and atomizing appliances so as to cause a circulation and recirculation of humid air through [illegible] substantially as and for the purposes described.

3. An apparatus for ordering tobacco, comprising a housing provided with a central chamber, side chambers provided with [illegible] ted roofs, top and bottom chambers, means in said central chamber for creating and maintaining a humid atmosphere therein and presenting continuously to tobacco in said side chambers to dampen and order the same, and a movable frame or truck having slatted bottoms mounted in said side chambers, substantially as and for the purposes described.

4. An apparatus for ordering tobacco, comprising a housing provided with a central chamber having atomizing and agitating appliances therein, side chambers adapted for

suspending tobacco therein, top and bottom chambers connected with said central chamber and in communication with said side chambers, provided with slatted bottoms and roofs for momentarily confining moist air in said chambers, a trough having absorbent material, a pan or drip receptacle in said central chamber and provided with a cover of absorbent material, and means for actuating said atomizing and agitating appliances, substantially as and for the purposes described.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

JOSIAH K. PROCTOR.

Witnesses:
THOMAS M. SMITH,
RICHARD C. MAXWELL.

1074

(No Model.) 3 Sheets—Sheet 1.

C. F. WINKLER.

INCUBATOR.

No. 286,7[illegible]. Patented Oct. 16, 1883.

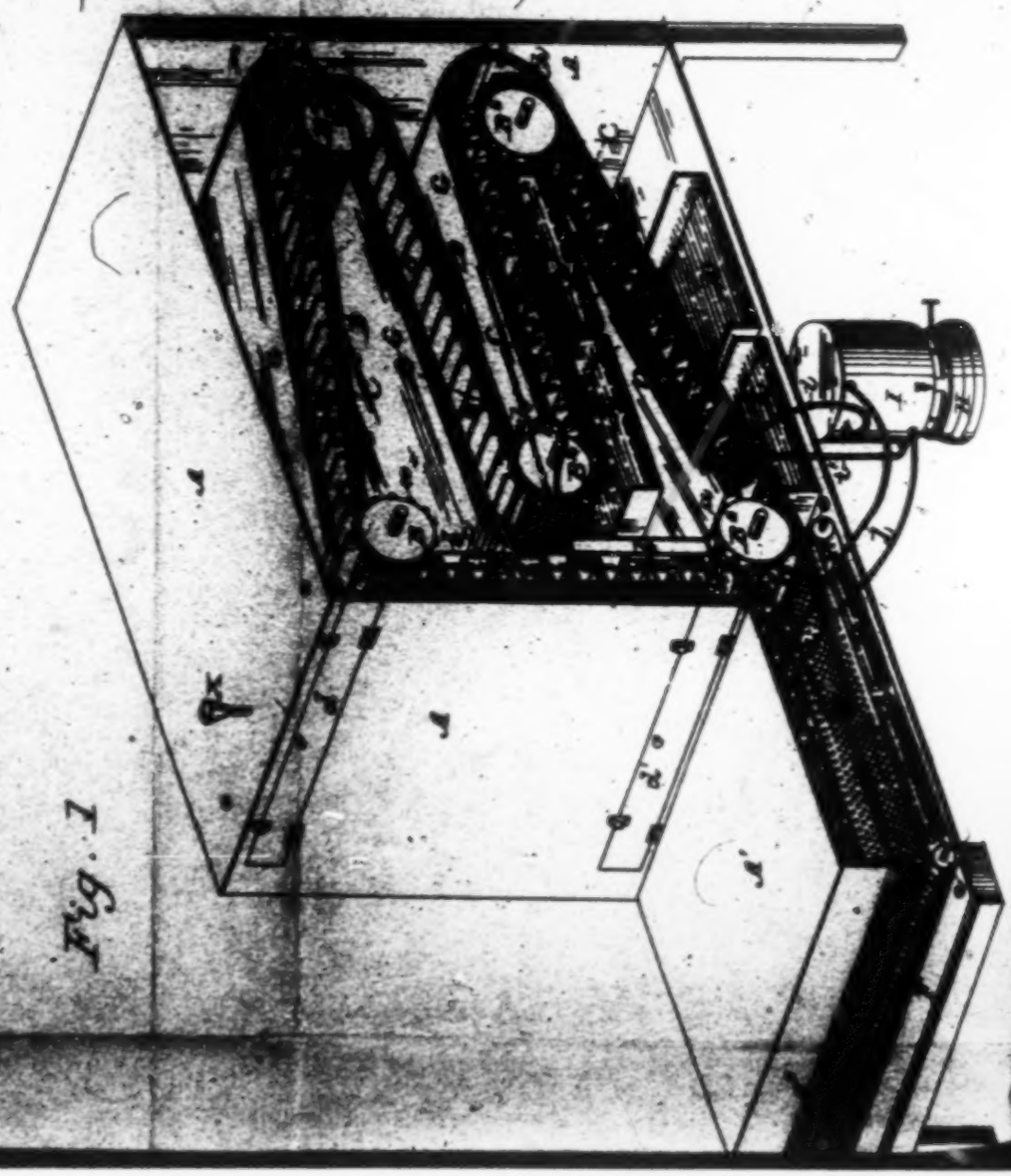


Fig. 1

No. 286,756. Patented Oct. 16, 1883.

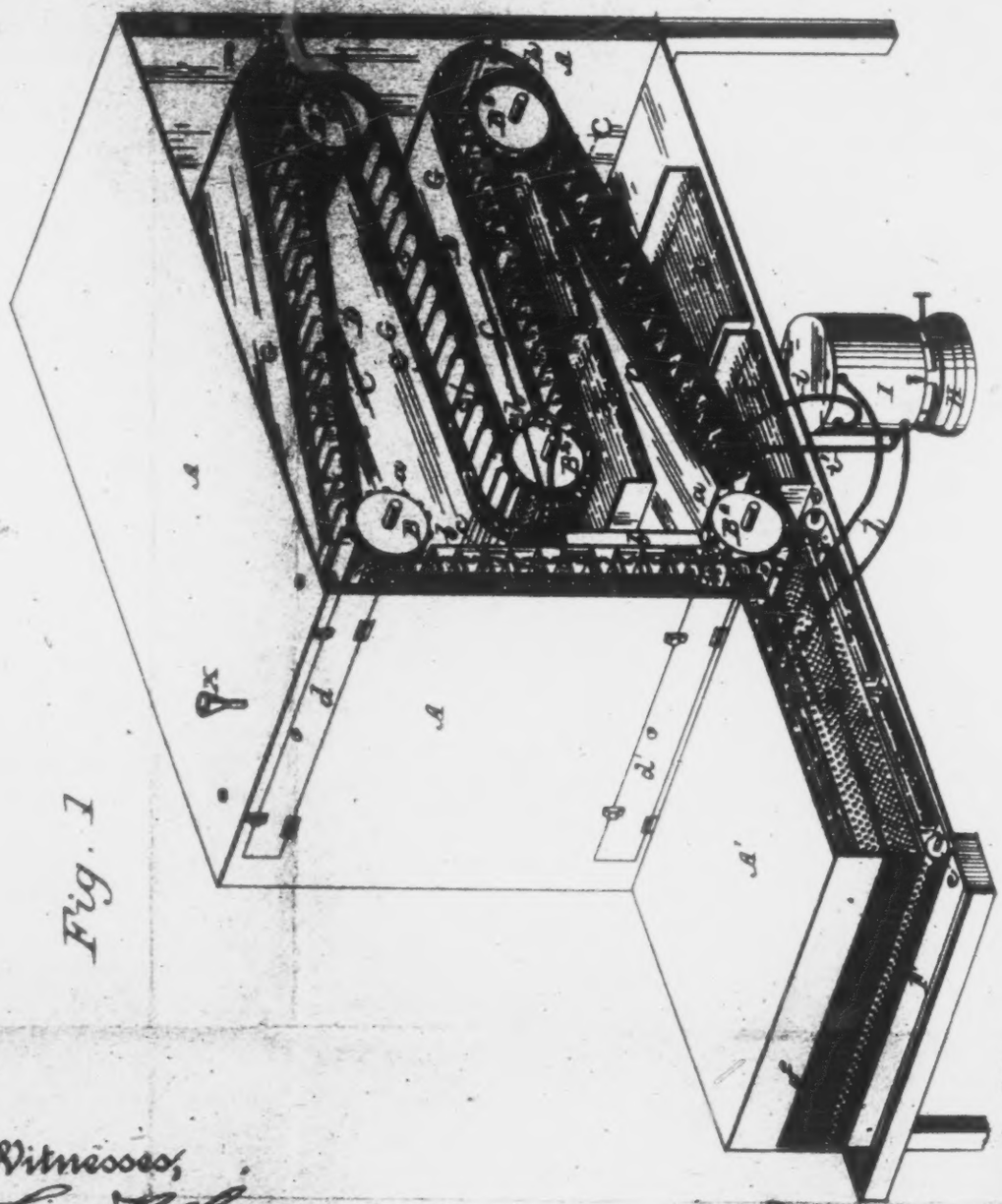


Fig. 1

Witnesses,
Geo. H. Strong.
J. A. Stowe

Inventor,
C. F. Winkler
by Dewey & Co.
Attorneys

1075

(No Model.) 3 Sheets—Sheet 2

C. F. WINKLER.

INCUBATOR.

No. 286,750. Patented Oct. 16, 1883.

Fig. 2.

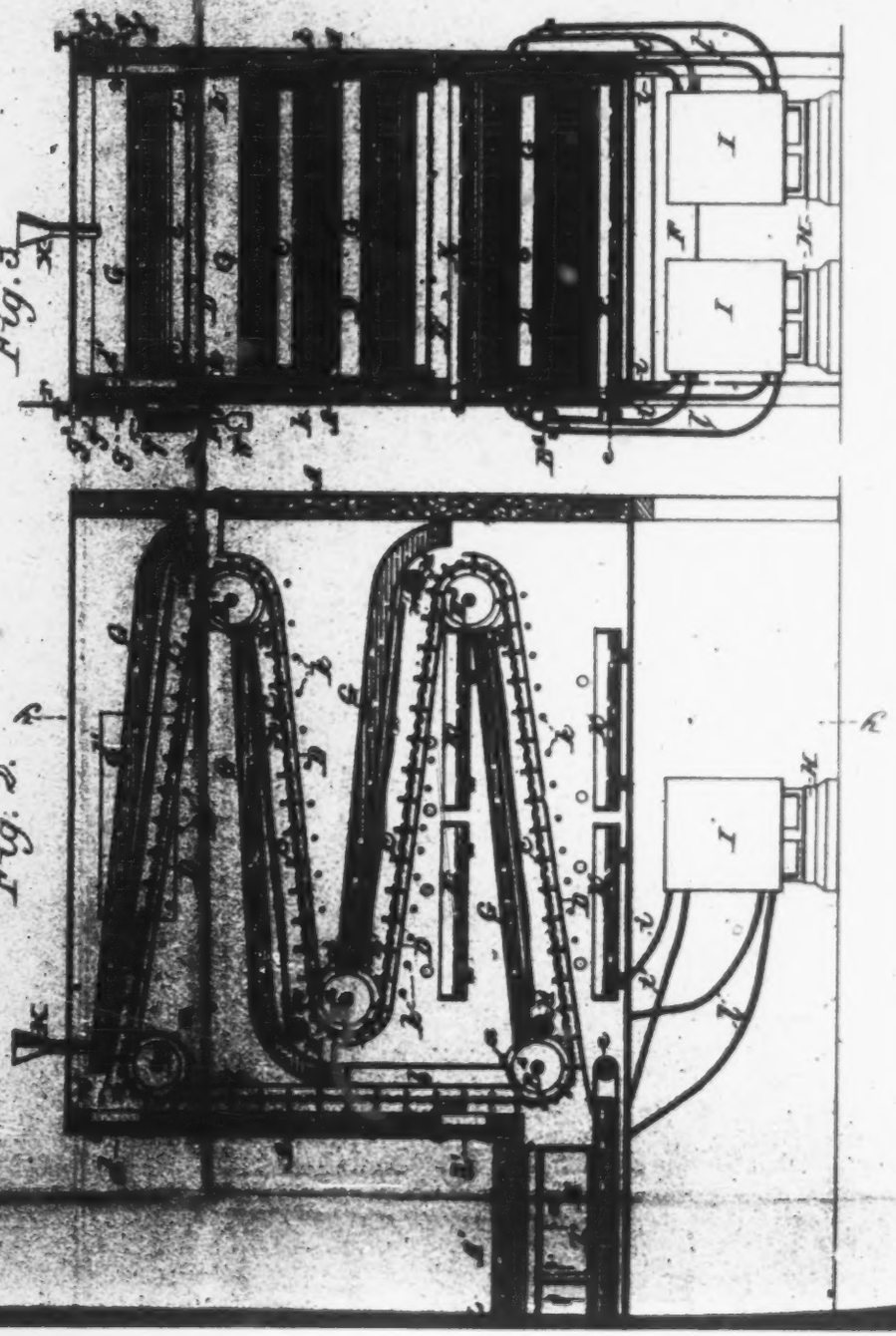


Fig. 3.

No. 286,754. Patented Oct. 16, 1883.

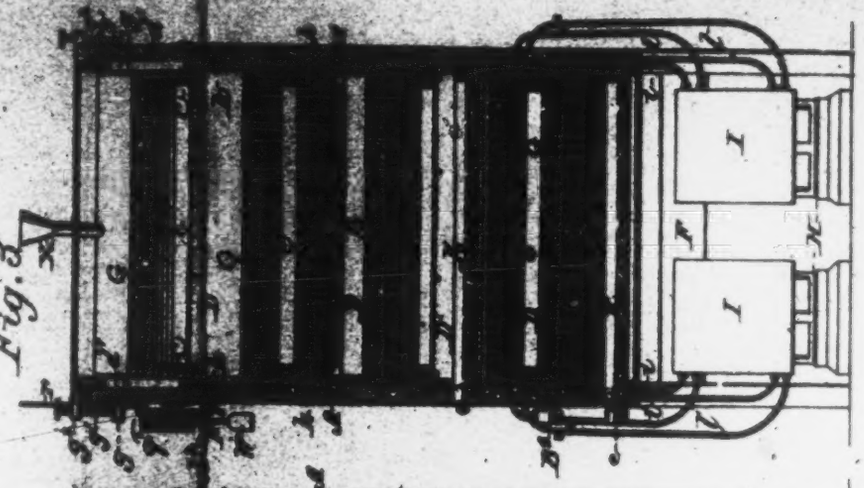


Fig. 3.

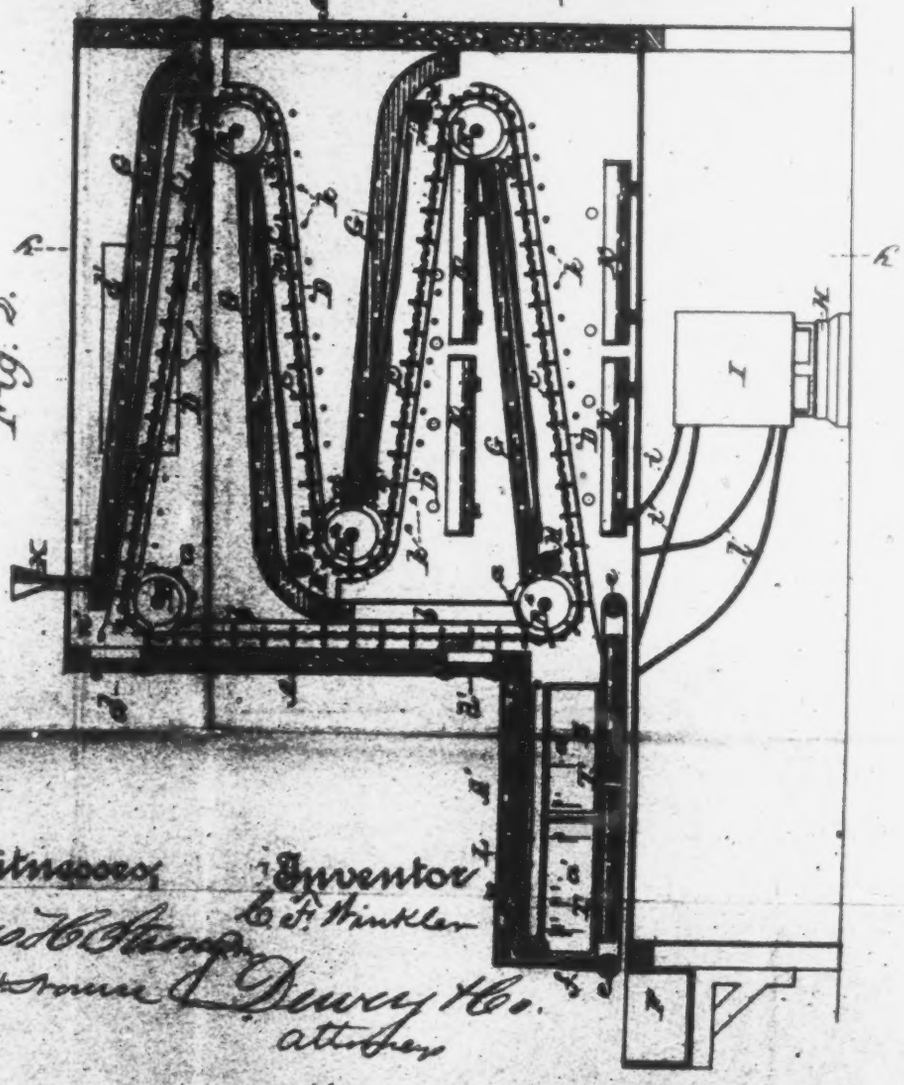


Fig. 2.

Witnesses:
Geo. H. Strong
Jos. Nourse

Inventor
C. F. Winkler
Dewey & Co.
attorneys

1076

(No Model.) 3 Sheets—Sheet 3.

C. F. WINKLER.

INCUBATOR.

No. 286,756. Patented Oct. 16, 1883.

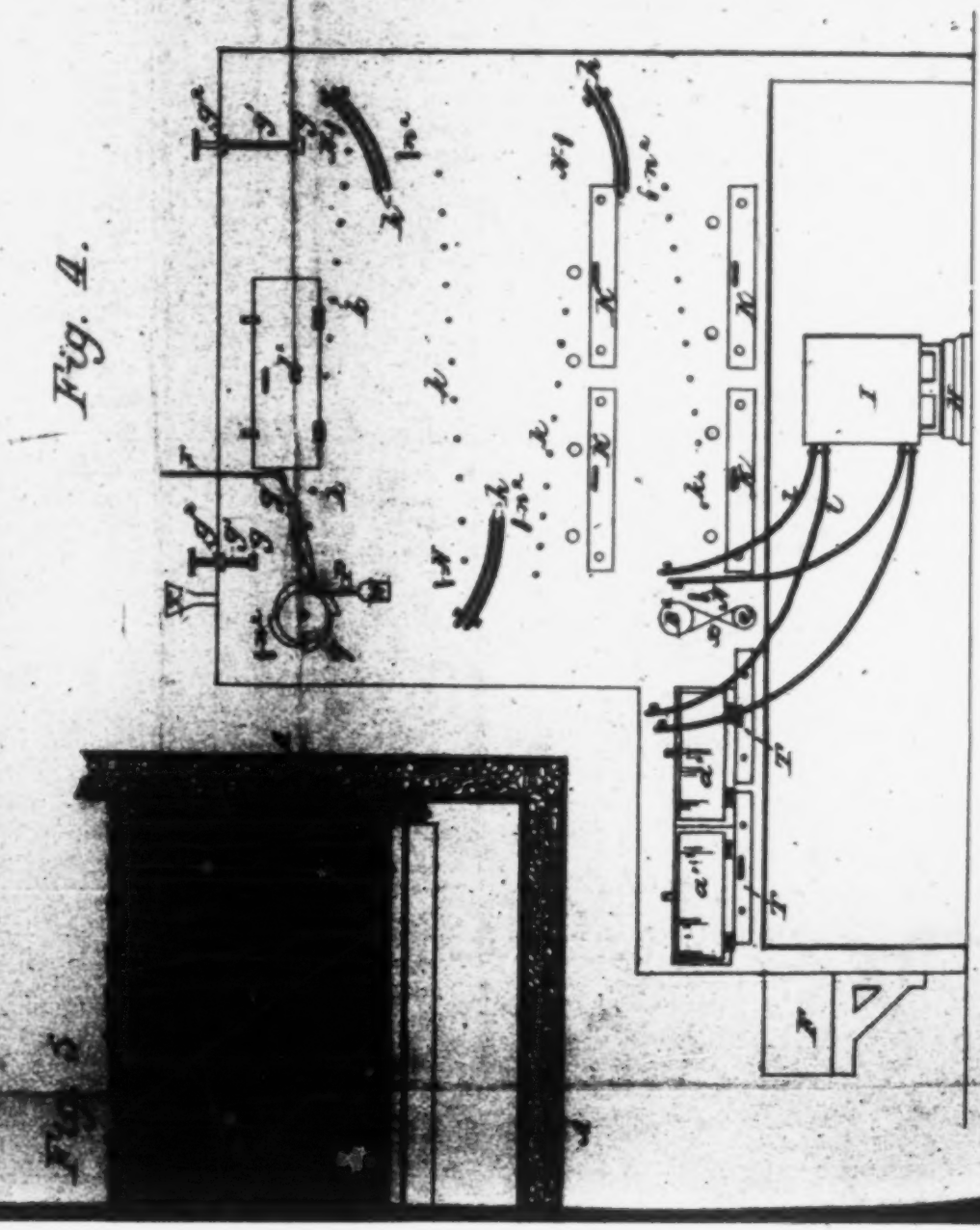


Fig. 4.

No. 286,756. Patented Oct. 16, 1883.

Fig. 4.

Fig. 5

Witnesses, Inventor
C. F. Winkler
Leo. C. Stamp
Lawrence Dewey & Co.
Attorneys

UNITED STATES PATENT OFFICE.

CHARLES F. WINKLER, OF BAKERSFIELD, CALIFORNIA

INCUBATOR.

SPECIFICATION forming part of Letters Patent No. 286,755, dated October 16, 1883.

Application filed May 17, 1883. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. WINKLER, of Bakersfield, county of Kern, State of California, have invented an Improvement in an Incubator; and I hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to certain new and useful improvements in the class of incubators employing an endless traveling conveyor for receiving and advancing the eggs; and the invention consists in novel features of construction and combination of parts, all as will be hereinafter fully described, and set forth in the claims hereto annexed.

The object I have in view in this invention is to overcome certain patent difficulties which attend the operation of machines now in use. A brief recital of these will serve to explain more clearly my object. During the progress of incubation the temperature must vary. At the beginning the eggs require a greater heat than at the close, because toward the end the embryo, having increased, furnishes a certain amount of heat for itself. For this reason the temperature produced by the apparatus should be gradually decreased during the process. This necessitates the complete charging of the incubator at the start. One lot of eggs cannot be introduced to-day and another in a week, because the temperature would be unsuitable for either one lot or the other. In large [illegible] of eggs at [illegible] ed as to allow the introduction of a fresh lot of eggs at [illegible] and given to each [illegible] temperature. This entails [illegible] or, if allowed to remain, the young, in struggling about while still wet, smear the unhatched eggs and prevent their hatching; or they injure themselves on the broken shells or in the interstices between the eggs. My machine hatches them in small batches removed from the unhatched eggs, so that the temperature is not lowered by removing them, nor are they injured, nor do they injure the other eggs. Again, the ordinary machines are not adapted for all kinds of eggs, (geese, turkey, duck, and chicken eggs placed therein promiscuously,) because these having different periods of incubation, the periods of temperature for one kind will not answer for another. My machine provides for this, so that I am enabled to place all kinds of eggs and give to each its required period and temperature. These are some of the difficulties which I overcome. The various other and minor advantages which I gain will appear during the course of the following description of the construction, which will be clearly seen by reference to the accompanying drawings, in which—

Figure 1, Sheet 1, is a perspective view of my machine, having one of its sides removed to show the interior. Fig. 2, Sheet 2, is a vertical longitudinal section of same. Fig. 3 is a cross-section on line *y y*, Fig. 2. Fig. 4, Sheet 3, is a side elevation of same. Fig. 5 is a portion of a plan, showing the conveyer.

A is the casing of the machine, having double [illegible] with some non-conduct- [illegible] over its [illegible] to the sides of [illegible] tank. B is a [illegible] and a little [illegible] [illegible] mounted in the [illegible] and a little farther in.

CHARLES F. WINKLER, OF BAKERSFIELD, CALIFORNIA

INCUBATOR.

SPECIFICATION forming part of Letters Patent No. 286,756, dated October 16, 1883.

Application filed May 17, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. WINKLER, of Bakersfield, county of Kern, State of California, have invented an Improvement in an Incubator; and I hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to certain new and useful improvements in the class of incubators employing an endless traveling conveyer for receiving and advancing the eggs; and the invention consists in novel features of construction and combination of parts, all as will be hereinafter fully described, and set forth in the claims hereto annexed.

The object I have in view in this invention is to overcome certain patent difficulties which attend the operation of machines now in use. A brief recital of these will serve to explain more clearly my object. During the progress of incubation the temperature must vary. At the beginning the eggs require a greater heat than at the close, because toward the end the embryo, having increased, furnishes a certain amount of heat for itself. For this reason the temperature produced by the apparatus should be gradually decreased during the process. This necessitates the complete charging of the incubator at the start. One lot of eggs cannot be introduced to-day and another in a week, because the temperature would be unsuitable for either one lot or the other. In large machines this immediate and large collection of eggs presents the difficulty of getting them fresh enough, or requires an outlay of money. My machine is constructed as to allow the introduction of a fresh lot of eggs at short intervals, and gives to each lot its own required temperature. This enables me to use successively perfectly fresh eggs without trouble, and makes the process continuous, which is a very desirable result in poultry-raising. Again, when all the eggs have reached an equal stage, and the young begin to come out, they are all crowded in the same apartment, or many are in several chambers. They hatch successively, not simultaneously, so that a great many are always out. This necessitates the constant opening of the door to remove them, which, by [illegible] temperature, affects injuriously the [illegible] or, if allowed to remain, the young, in struggling about while still wet, smear the unhatched eggs and prevent their hatching; or they injure themselves on the broken shells or in the interstices between the eggs. My machine hatches them in small batches removed from the unhatched eggs, so that the temperature is not lowered by removing them, nor are they injured, nor do they injure the other eggs. Again, the ordinary machines are not adapted for all kinds of eggs, (goose, turkey, duck, and chicken eggs placed therein promiscuously,) because these having different periods of incubation, the periods of temperature for one kind will not answer for another. My machine provides for this, so that I am enabled to place all kinds of eggs and give to each its required period and temperature. These are some of the difficulties which I overcome. The various other and minor advantages which I gain will appear during the course of the following description of the construction, which will be clearly seen by reference to the accompanying drawings, in which—

Figure 1, Sheet 1, is a perspective view of my machine, having one of its sides removed to show the interior. Fig. 2, Sheet 2, is a vertical longitudinal section of same. Fig. 3 is a cross-section on line *y y*, Fig. 2. Fig. 4, Sheet 3, is a side elevation of same. Fig. 5 is a portion of a plan, showing the conveyer.

A is the casing of the machine, having double-spaced walls filled with some non-conducting material.

B is a hollow drum perforated over its surface, and mounted transversely in the sides of the machine near its top at one end. B' is a similar drum, mounted in the other end and a little lower down. B² is a drum mounted in the first end, lower down and a little farther in. B³ is a drum at the other end, and B⁴ a drum at the bottom in the first end.

C C are endless chains passing over the ends of the drums and following a course from B down to and around B², to and around B³, to and around B', to and around B⁴, and up vertically [illegible] inner wall A, to the point of [illegible] ends of the drums are provided [illegible] similar to a sprocket-[illegible] with the links of the [illegible] a positive motion there-

for. On account of the position of the drums the course of the chains is inclined downwardly to drum B'. Secured at short intervals in the chains are the tranverse slats *c*, which form a conveyer, as I shall explain. These slats are secured to the chains at the middle line of their ends, thus making half the width of the slat below and half above the chains, for the reason that in turning around the drums they become reversed edge for edge. These slats travel over flooring D. This may consist of any perforated material, wire screen being preferable, to permit ventilation. This flooring is in sections, the uppermost piece lying between the drums B B', the next between drums B' B², and so on down. The top section is straight; but the others are bent around the upper drum of each, following its curvature to a point above its center, in order to receive and guard the eggs when traveling around the drum, and to keep them to their places between the slats. The lowest of these flooring-sections opens down upon an endless perforated belt or carrier, E, placed in a horizontal plane, and traveling over rollers *e* within an extension, A', of the main casing A.

I shall now explain the operation and advantages of the devices as far as described.

In one end of the machine, at its top, is a door, *d*, another, *d'*, in its sides, below the former, and another, *d²*, in its other end. The conveyer, consisting of the chains and slats, travels downward at certain times by means which I shall hereinafter describe. The length of the belt and the distances of its periodical progression are so regulated that from the point where a slat, *c*, passes the door *d²* to the point where it turns and begins to ascend will be about nineteen days. This period covers the time during which it is found necessary to turn chicken eggs. From the point where the conveyer passes the door *d'* to the lowest point, the period is from twenty-five to twenty-eight days, and from the very top at door *d* to bottom it is about thirty days. These periods cover the time necessary for turning other than chicken eggs. The eggs are placed between the slats and rest upon the floors D. The chicken eggs are placed into the conveyer through the door *d*, the duck and turkey eggs through door *d'*, and the goose eggs through door *d²*. Knowing the times at which the conveyer is advanced the set distances, I am ready with a fresh lot of eggs to put through the machine at each advance. The advances at one time is regulated to turn them a quarter or a half a turn, as the case may be. The curved ends of the floor-sections D receive the eggs as they come around the drums. When they reach the bottom the chicks will have picked the shells, and the eggs must not thereafter be turned. This is the object of the horizontal traveling carrier E. This carrier is advanced at intervals at such a rate that it may take, say, about three days to reach the end. The eggs do not roll on the carrier, but are advanced. The chicks come out, and are removed through side doors, *a'*, while the shells and bad eggs continue, and are discharged through the open end of the extension A' into a receptacle, F. The end of the extension is preferably covered by a fringe, *f*. It will be observed that the place in which the chicks are hatched is sufficient in area not to be crowded, thereby giving the chicks a fair chance, and they are sufficiently removed from the other eggs yet in process to prevent injury to them.

I shall now describe the means by which I obtain the desired temperature.

Over the conveyer, above all its folds and following its inclination, are the sections of water-jacket G. These are independent of each other, and are suspended at their ends by means of blocks *g*, projecting through slots in the casing A, and the screws *g'*, attached at their lower ends to the blocks *g*, and passing vertically through suitable holes in the blocks *g'*, Fig. 4. By turning these screws each section of water-jacket may be raised or lowered independently. The ends of these sections are curved, where necessary, to follow the course of the conveyer, and they are preferably tapered to their upper ends, in order to reduce their thickness and provide for a greater vertical play in small space. The ends of the sections of water-jacket G are connected with each other by two flexible pipes, *k*. Of these one joins the bottoms of the jackets and the other the tops, whereby the free circulation of the hot and cold water is permitted. Under the machine are the coal-oil stoves H, having the boilers I. From the tops of these boilers extend flexible pipes *i* to the upper portions of the lower end of the lowest section of water-jacket G. Flexible pipes *i'* join the bottoms of the boilers with the lower portion of said sections. These connecting-pipes, being flexible, permit the adjustment of each section of

below and half above the chains, for the reason that in turning around the drums they become reversed edge for edge. These slats travel over flooring D. This may consist of any perforated material, wire screen being preferable, to permit ventilation. This flooring is in sections, the uppermost piece lying between the drums B B', the next between drums B' B², and so on down. The top section is straight; but the others are bent around the upper drum of each, following its curvature to a point above its center, in order to receive and guard the eggs when traveling around the drum, and to keep them to their places between the slats. The lowest of these flooring-sections opens down upon an endless perforated belt or carrier, E, placed in a horizontal plane, and traveling over rollers *e* within an extension, A', of the main casing A.

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jmity to or farther from the eggs, in order to give them the heat required at whatever stage of the process they may be. In like manner, the adjustment of one end of a section will provide for any change in temperature which may be required in the extent of one fold of the conveyer.

X is the funnel, through which the water-jacket and boilers are filled. Small holes *k* through the sides of the casing A provide for the admission of fresh air under the perforated floor-sections. Under the lower two floor-sections I have the water-trays K, to provide moisture during the later stages of the process, when it is most needed. Over the horizontal carrier E, I have a separate water-jacket, L, which is connected with the top and bottom of boiler by pipes *l*. The heat of this is regulated to give the required temperature during the very latest stages of incubation.

The eggs require to be cooled about once a day. This I do by the following means: Mounted transversely in the casing over the bends or turns in the conveyer, and between it and the water-jackets, are rollers M, upon which are wound curtains *m*, of some kind of cloth or fabric. With the edges of these are connected strings *n*, which extend over the conveyer, and are wound on a shaft, *n'*, having crank *n²*. By winding these strings the curtains are unwound and lie over the eggs, shielding them from the heat. When sufficiently cool, they are wound back upon their rollers. This is done by small cranks N on their ends, though I may provide them with springs to operate automatically, as ordinary window-curtains work.

In Fig. 4 I show a portion of the means by which I cause the periodic advancement of the conveyer. The end of drum B, or a gudgeon thereon, projects through the side of the casing, and has a coril, P, wound thereon. This coril suspends a weight, W, which is sufficient, with the weight of the conveyer and its load, to cause said conveyer to advance with a positive motion. Upon the drum is a ratchet, [illegible] with which a pivoted latch, *g'*, engages. The upper arm of this latch is heavy enough to cause the point to engage with the ratchet and hold the drum stationary. The end of the latch is connected by a rod, *r*, with clock-work, which I have not deemed it necessary to show [illegible] at regular periods—say every six hours—

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an incubator, a conveyer for receiving the eggs, and means for advancing said conveyer periodically, in combination with heating devices arranged to give the heat requisite at all points during the progress of the eggs, substantially as and for the purposes herein described.

2. In an incubator, a conveyer for receiving the eggs, consisting of spaced slats, between which the eggs lie, and means for advancing it, in combination with an inclined floor, down which the conveyer travels and upon which the eggs rest, whereby they turn with the advancement of the conveyer and their own progress, substantially as and for the purposes herein described.

3. In an incubator, the drums B, B', B², B³, and B⁴, having teeth *a*, the endless chain C C, having spaced cross-slats *c*, and a means for advancing said chains and slats, in combination with the perforated floor-sections D, over which the slats travel, substantially as and for the purpose herein described.

4. In an incubator, the hollow perforated drums B, B', B², B³, and B⁴, having teeth *a*, the endless chains C C, having spaced cross-slats *c*, and a means for advancing said chains and slats, in combination with the perforated floor-sections D, having their upper ends concentric with the drums for a short distance, substantially as and for the purpose herein described.

5. In an incubator, the casing A, having doors *d d' d²*, in combination with the endless egg-conveyer consisting of the endless chains C C and cross-slats *c*, passing said doors, and a means for advancing said conveyer, substantially as and for the purpose herein described.

6. In an incubator, the drums B B' B² B³ B⁴, the endless chains C C and spaced slats *c*, and means for advancing said chains and slats, and the perforated floor-sections D, in combination with the water-jackets G, placed over the slats, and means for heating the water therein, substantially as and for the purpose herein described.

7. In an incubator, the drums B B' B² B³ B⁴, the endless chains C C and spaced slats *c*, and means for advancing said chains and slats, and the perforated floor-sections D, in combina-

conveyer.

X is the funnel, through which the water-jacket and boilers are filled. Small holes *z* through the sides of the casing A provide for the admission of fresh air under the perforated floor-sections. Under the lower two floor-sections I have the water-trays K, to provide moisture during the later stages of the process, when it is most needed. Over the horizontal carrier E, I have a separate water-jacket, L, which is connected with the top and bottom of boiler by pipes *l*. The heat of this is regulated to give the required temperature during the very latest stages of incubation.

The eggs require to be cooled about once a day. This I do by the following means: Mounted transversely in the casing over the bends or turns in the conveyer, and between it and the water-jackets, are rollers M, upon which are wound curtains *m*, of some kind of cloth or fabric. With the edges of these are connected strings *n*, which extend over the conveyer, and are wound on a shaft, *n'*, having crank *n²*. By winding these strings the curtains are unwound and lie over the eggs, shielding them from the heat. When sufficiently cool, they are wound back upon their rollers. This is done by small cranks N on their ends, though I may provide them with springs to operate automatically, as ordinary window-curtains work.

In Fig. 4 I show a portion of the means by which I cause the periodic advancement of the conveyer. The end of drum B, or a gudgeon thereon, projects through the side of the casing, and has a cord, P, wound thereon. This cord suspends a weight, W, which is sufficient, with the weight of the conveyer and its eggs, to cause said conveyer to advance with a positive motion. Upon the drum is a ratchet, *p*, with which a pivoted latch, *q*, engages. The outer arm of this latch is heavy enough to cause its point to engage with the ratchet and hold the drum stationary. The end of the latch is connected by a rod, *r*, with clock-work, which I have not deemed it necessary to show in detail. At stated periods—say every six hours—the clock-work raises rod *r*, withdrawing the latch from the ratchet momentarily. The drum then turns, advancing the conveyer. The rod is immediately relieved, and the latch drops to engage with the next tooth of the ratchet and stop the conveyer. By regulating the diameter of this ratchet the advancement of the conveyer is rendered definite. Between the top and bottom of the horizontal carrier E are water-trays T, for supplying moisture. In order to impart a forward motion to the horizontal carrier E, I have the cross-belt *s*, Fig. 1, from the drum B' to one of the rollers *e*.

ing devices arranged to give the heat requisite at all points during the progress of the eggs, substantially as and for the purposes herein described.

2. In an incubator, a conveyer for receiving the eggs, consisting of spaced slats, between which the eggs lie, and means for advancing it, in combination with an inclined floor, down which the conveyer travels and upon which the eggs rest, whereby they turn with the advancement of the conveyer and their own progress, substantially as and for the purposes herein described.

3. In an incubator, the drums B, B', B², B³, and B⁴, having teeth *a*, the endless chain C C, having spaced cross-slats *c*, and a means for advancing said chains and slats, in combination with the perforated floor-sections D, over which the slats travel, substantially as and for the purpose herein described.

4. In an incubator, the hollow perforated drums B, B', B², B³, and B⁴, having teeth *a*, the endless chains C C, having spaced cross-slats *c*, and a means for advancing said chains and slats, in combination with the perforated floor-sections D, having their upper ends concentric with the drums for a short distance, substantially as and for the purpose herein described.

5. In an incubator, the casing A, having doors *d d' d²*, in combination with the endless egg-conveyer consisting of the endless chains C C and cross-slats *c*, passing said doors, and a means for advancing said conveyer, substantially as and for the purpose herein described.

6. In an incubator, the drums B B' B² B³ B⁴, the endless chains C C and spaced slats *c*, and means for advancing said chains and slats, and the perforated floor-sections D, in combination with the water-jackets G, placed over the slats, and means for heating the water therein, substantially as and for the purpose herein described.

7. In an incubator, the drums B B' B² B³ B⁴, the endless chains C C and spaced slats *c*, and means for advancing said chains and slats, and the perforated floor-sections D, in combination with the superposed sections of water-jacket G, means for heating the water therein, and means for adjusting them vertically, substantially as and for the purpose herein described.

8. In an incubator, the tortuous conveyer consisting of the endless chains C C and cross-slats *c*, and means for advancing it, and the perforated floor-sections D, in combination with superposed sections of water-jacket G, means for vertically adjusting them independently, the flexible connecting-pipes *h*, the boilers I, and flexible connecting-pipes *i i'*, sub-

stantially as and for the purpose herein described.

9. In an incubator, the traveling conveyer, as herein described, and [illegible] it, in combination with [illegible] carrier, substantially as and [illegible]

10. In an incubator, the endless conveyer consisting of the [illegible] and the drawers D, upon which the [illegible] with the horizontal [illegible] for attaching it, substantially as and for the purpose herein [illegible]

11. In an incubator, the traveling conveyer, as herein described, in combination with the [illegible] and the superposed water-jacketed sections I, and [illegible] as and for the purpose herein described.

12. In an incubator, the traveling conveyer, as herein described, and the superposed sections of water-jacket G, in combination with the intervening curtains, *m*, substantially as and for the purpose herein described.

13. In an incubator, the traveling conveyer, as herein described, and the superposed sections of water-jacket G, in combination with the rollers M, the curtains *m* thereon, and the draw-strings *n*, substantially as and for the purpose herein described.

14. In an incubator, the endless conveyer, as herein described, in combination with the means for advancing it periodically, consisting of the driving-drum B, the rope P, and weight W, and the holding mechanism consisting of the ratchet *q* and pivoted latch *q'*, which are to be operated by a momentary releasing mechanism, substantially as and for the purpose herein described.

In witness whereof I have hereunto set my hand.

CHARLES F. WINKLER.

Witnesses:
WM. F. BOOTH,
J. H. BLOOD.

1081

(No Model.)

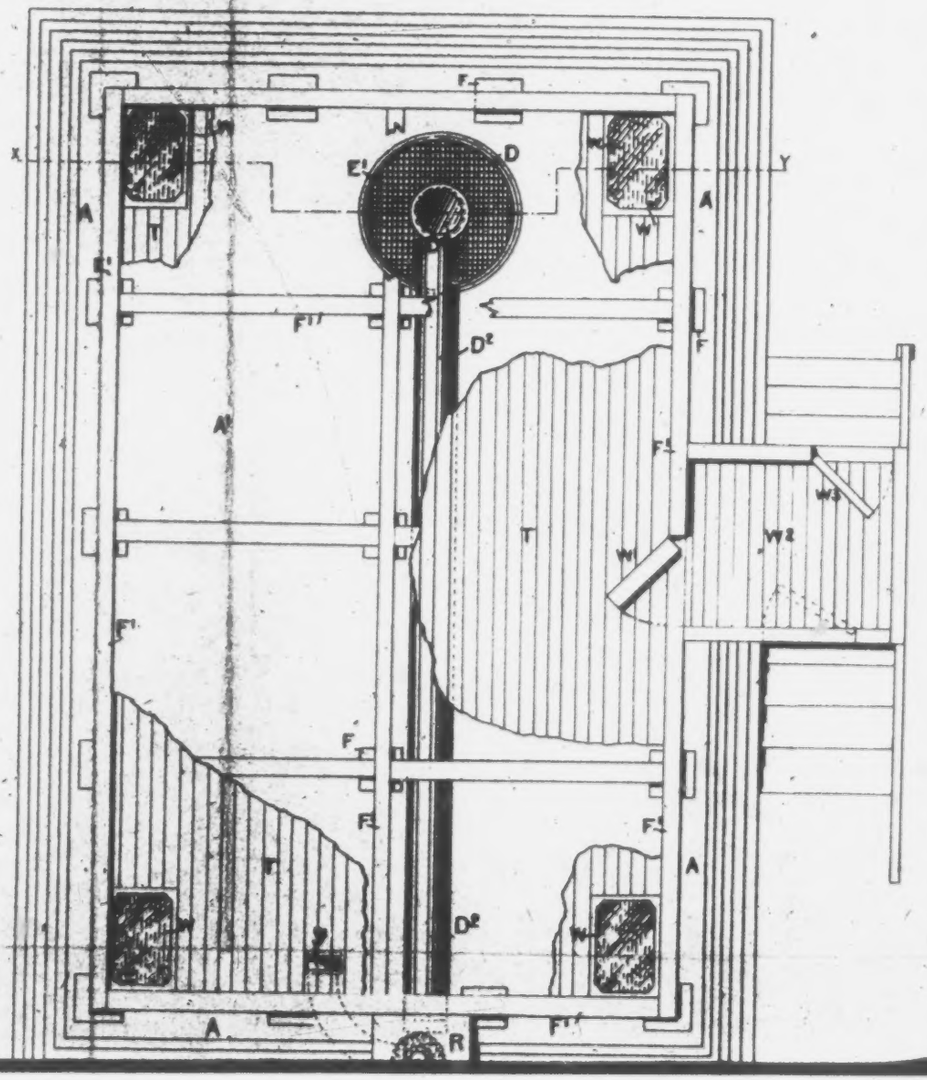
7 Sheets—Sheet 1.

W. VAN DER HEYDEN.

SANITARY HOUSE.

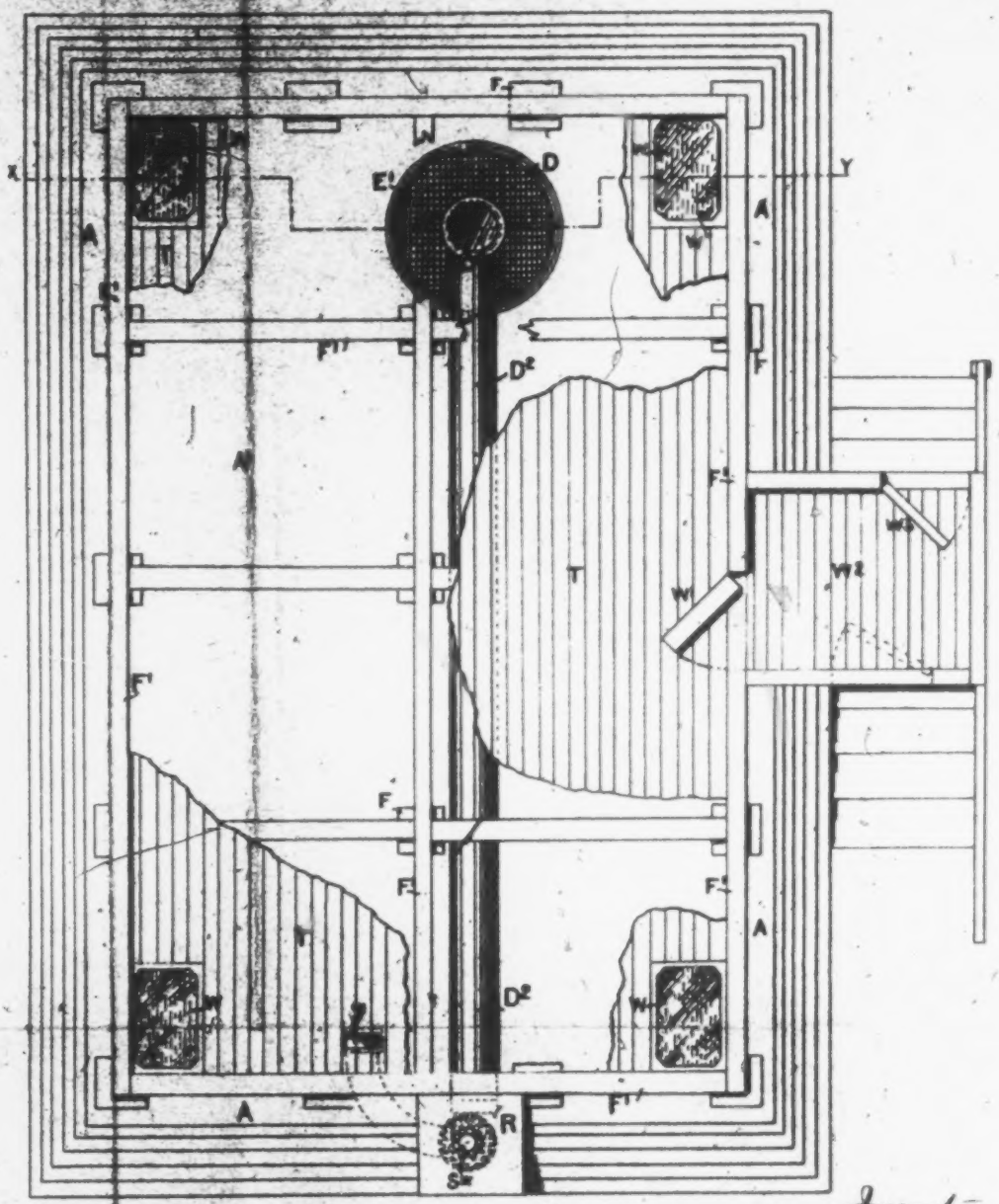
No. 504,544. Patented Sept. 5, 1893.

— FIG. I. —



No. 604,514. Patented Sept. 6, 1898.

— FIG. 1. —



Witnesses
Chas. N. Smith
J. Stair

Inventor
W. van der Heyden
per Lemuel W. Serrell
Atty

1082

(No Model.) 7 Sheets—Sheet 2.

W. VAN DER HEYDEN.

SANITARY HOUSE.

No. 504,544. Patented Sept. 5, 1893.

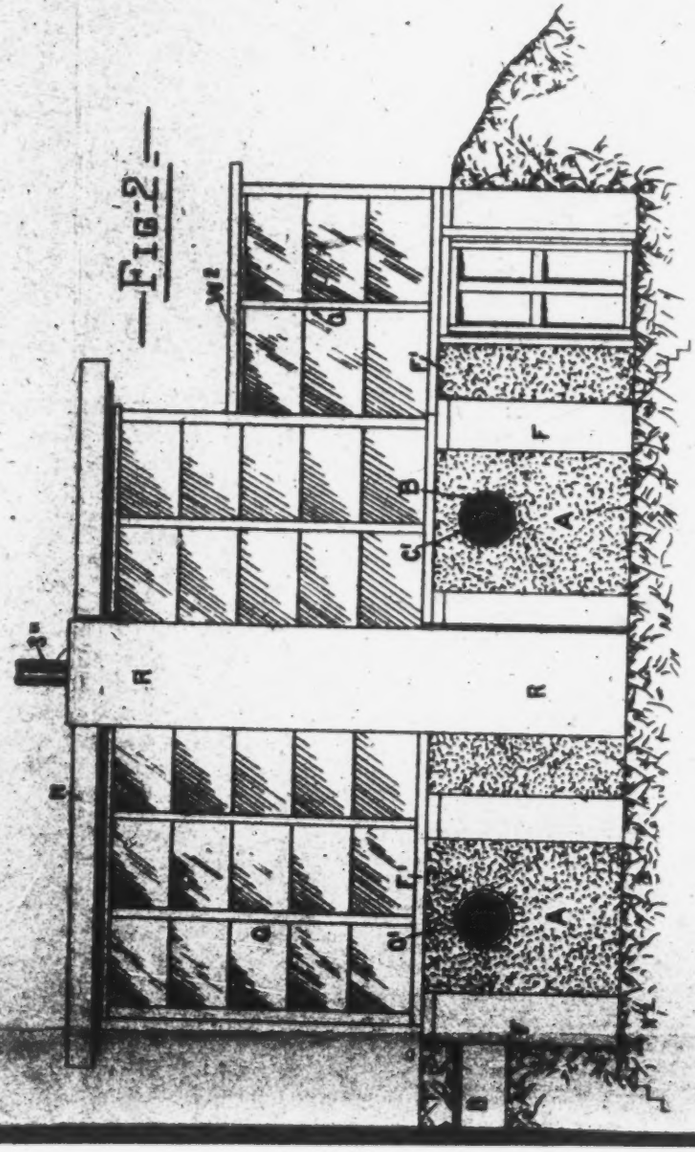
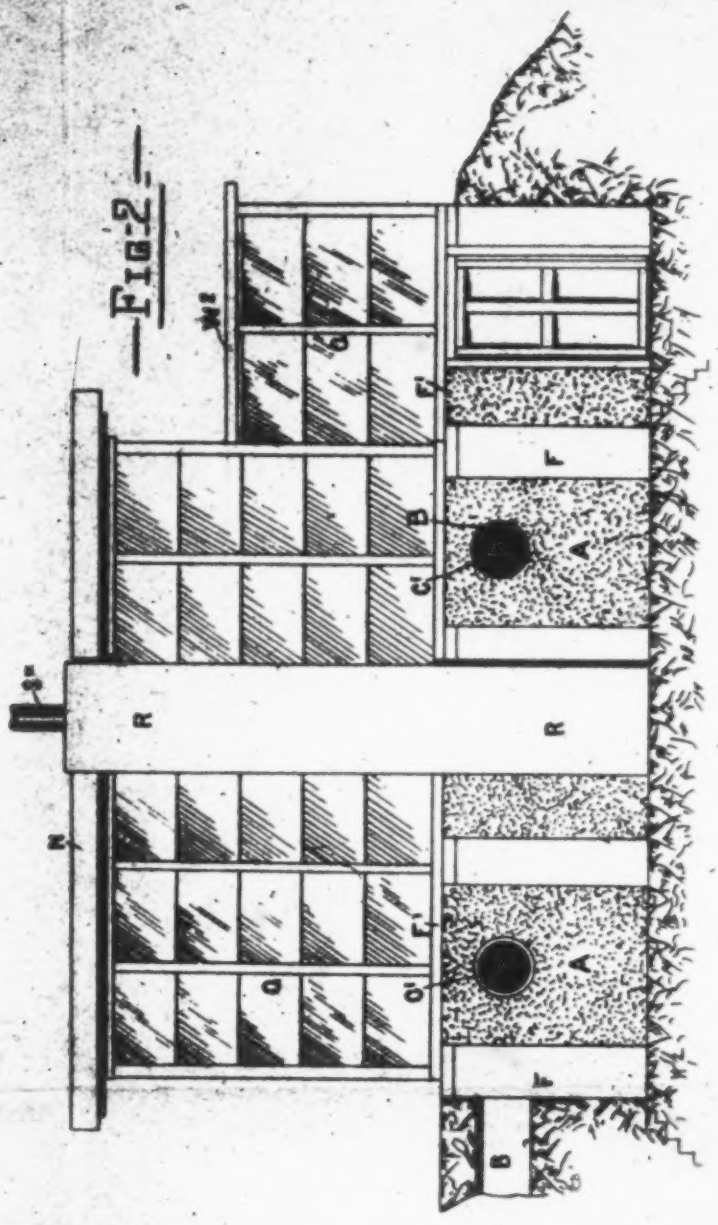


Fig-2



Witnesses
Chas. H. Smith
J. Stait

Inventor
W. van der Heyden
per Lemuel W. Serrell
Atty

1083

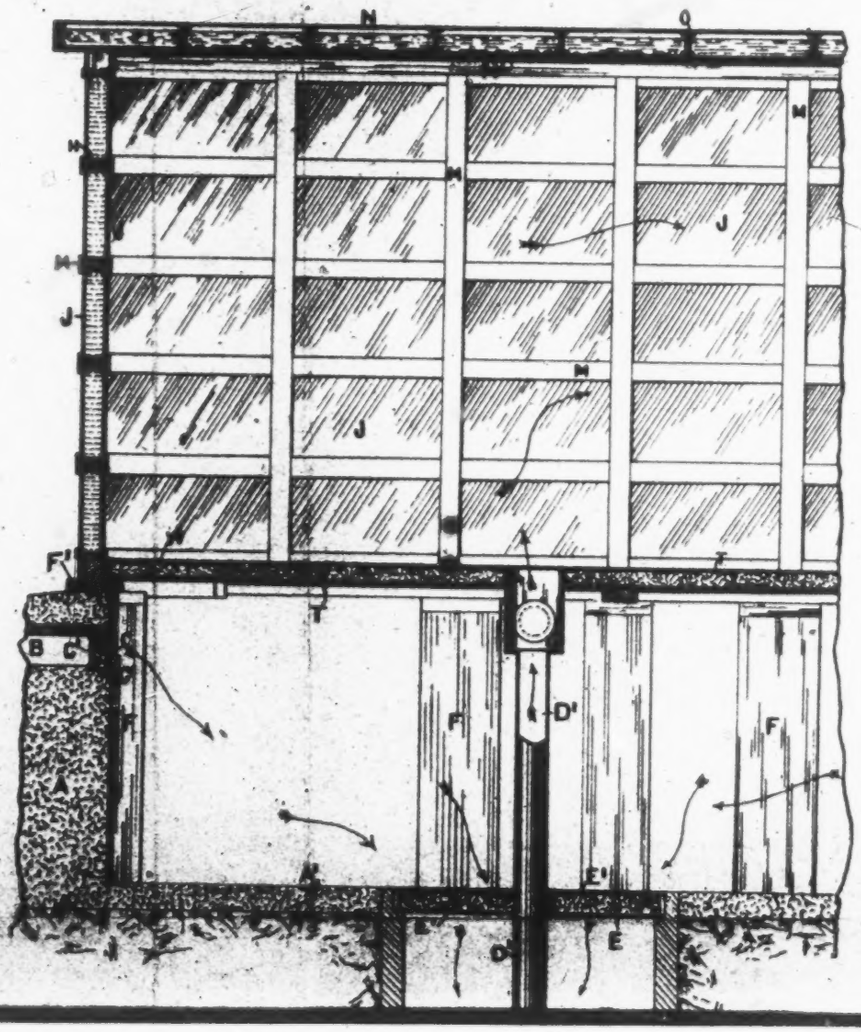
(No Model.) 7 Sheets—Sheet 3.

W. VAN DER HEYDEN.

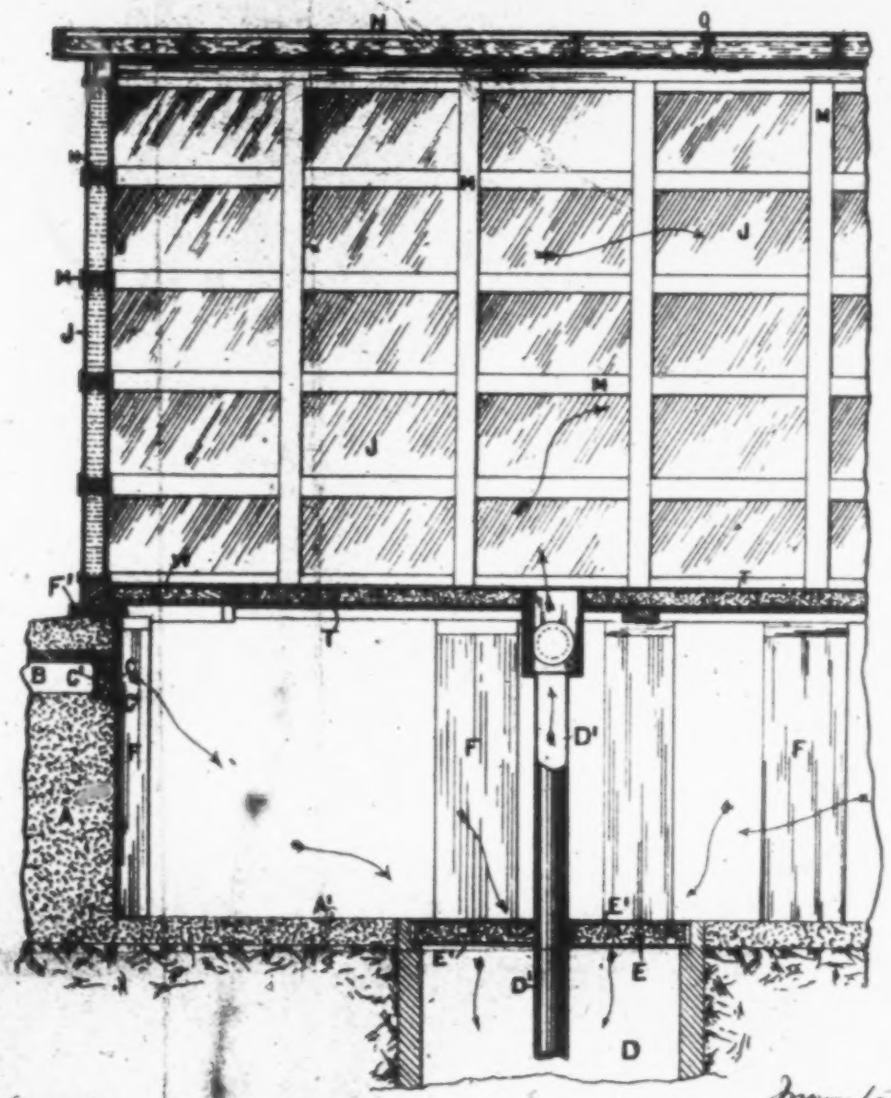
SANITARY HOUSE.

No. 504,544. Patented Sept. 5, 1893.

— FIG. 3. —



— FIG. 3 —



Witnesses
Chas. H. Smith
J. Stair

Inventor
W. van der Heyden
per Lemuel W. Serrell
Atty

1084

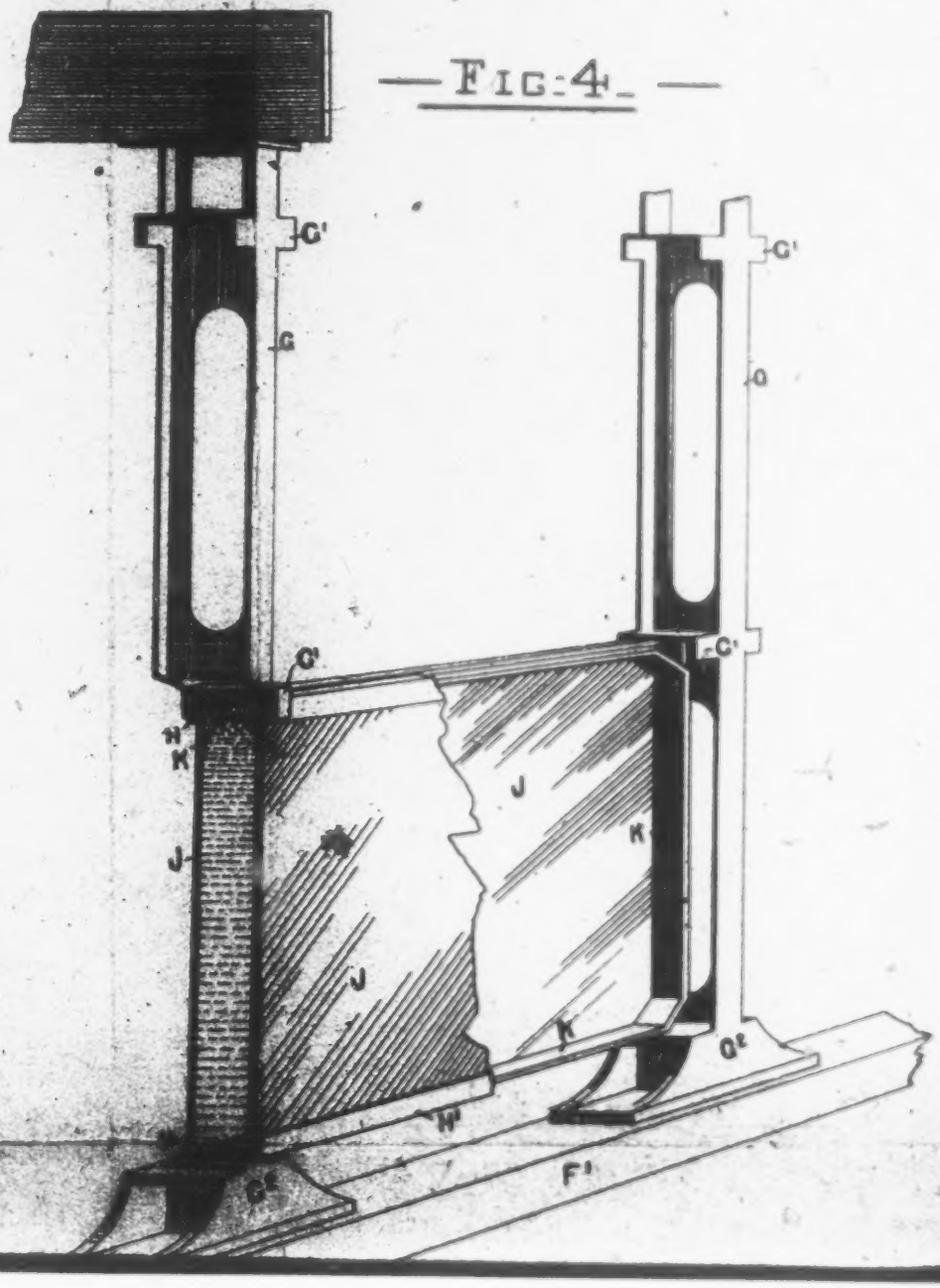
(No Model.) 7 Sheets—Sheet 4.

W. VAN DER HEYDEN.

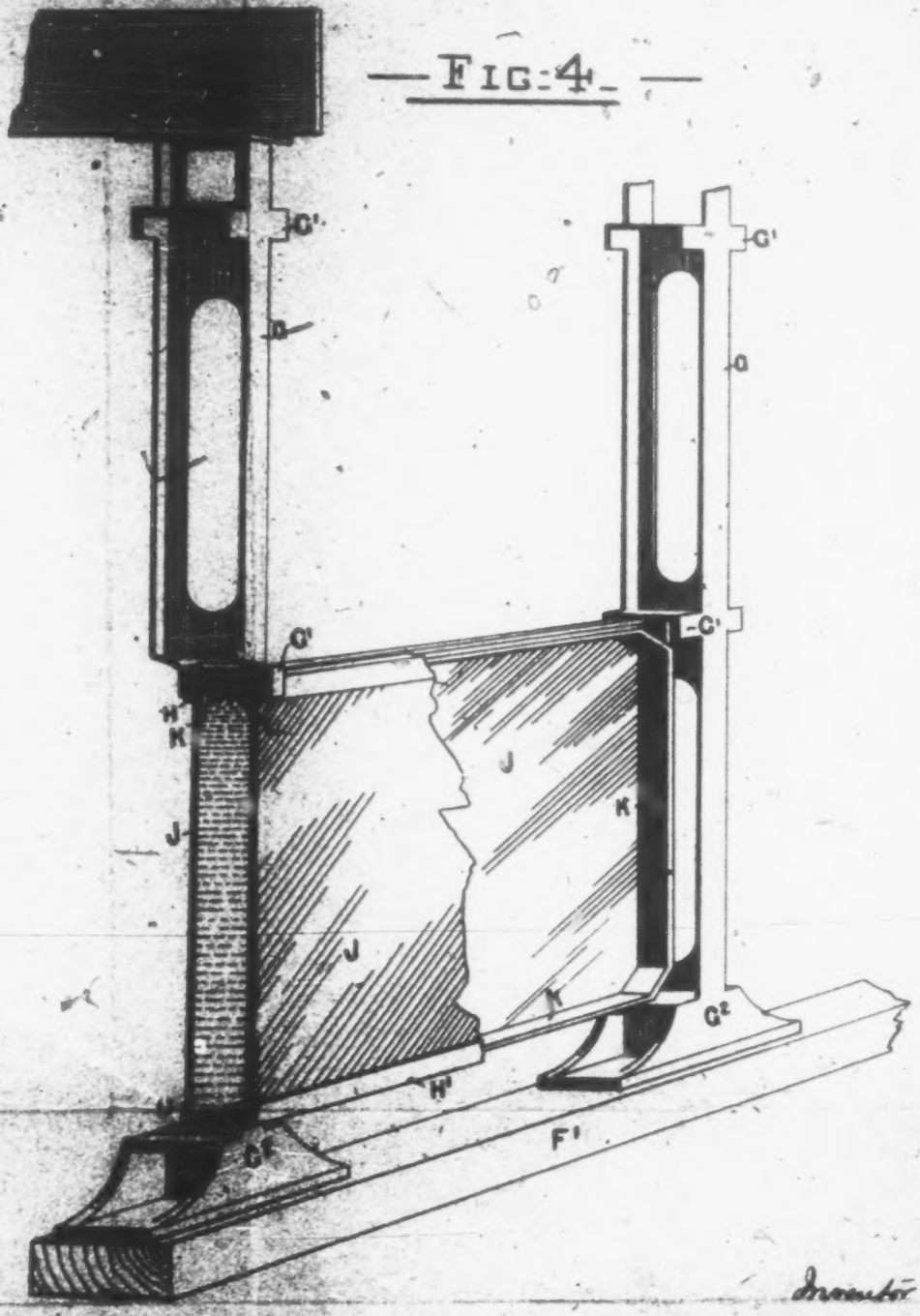
SANITARY HOUSE.

No. 504,544. Patented Sept. 5, 1893.

FIG. 4.



— FIG: 4 —



Witnesses
Chas. A. Smith
J. Stail

Inventor
W. van der Heyden
per Lemuel W. Serrell
Atty

1085

(No Model.) 7 Sheets—Sheet 5.

V. VAN DER HEYDEN.

SANITARY HOUSE.

No. 504,544. Patented Sept. 5, 1893.

FIG. 5.

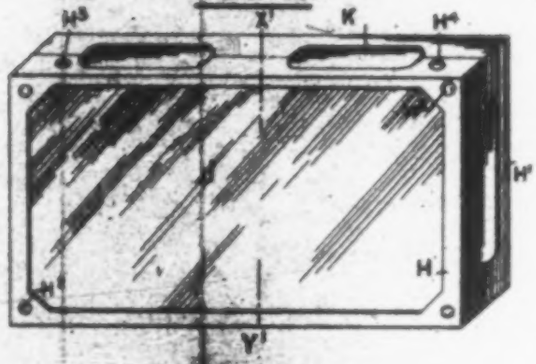


FIG. 6.

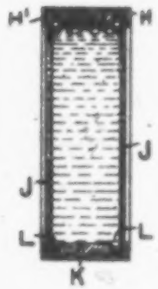


FIG. 7.

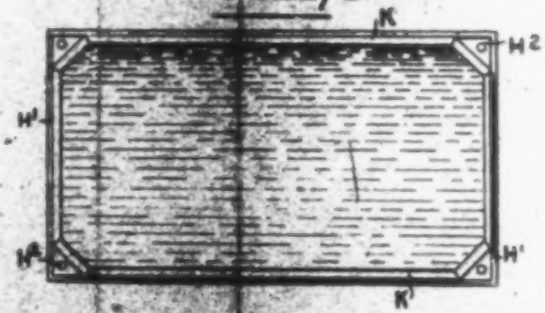
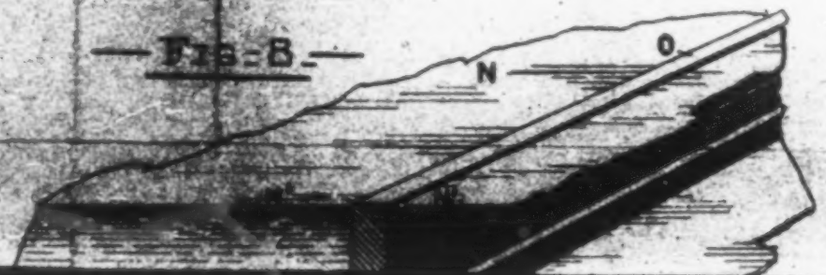


FIG. 8.



No. 504,544. Patented Sept. 5, 1893.

FIG. 5.

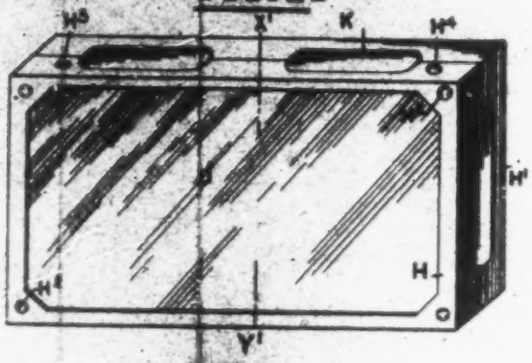


FIG. 6.

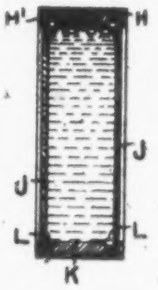


FIG. 7.

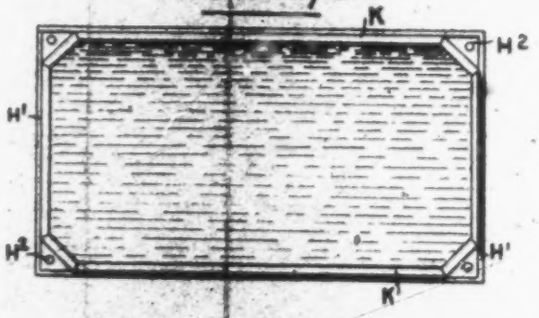
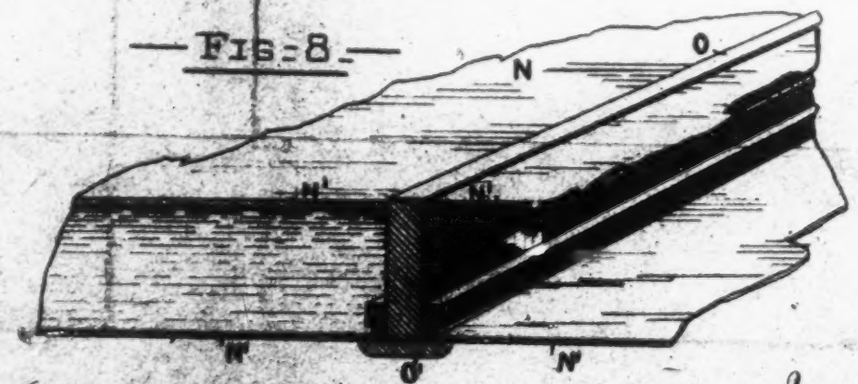


FIG. 8.



Witnesses
Chas. H. Smith
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W. van der Weyde
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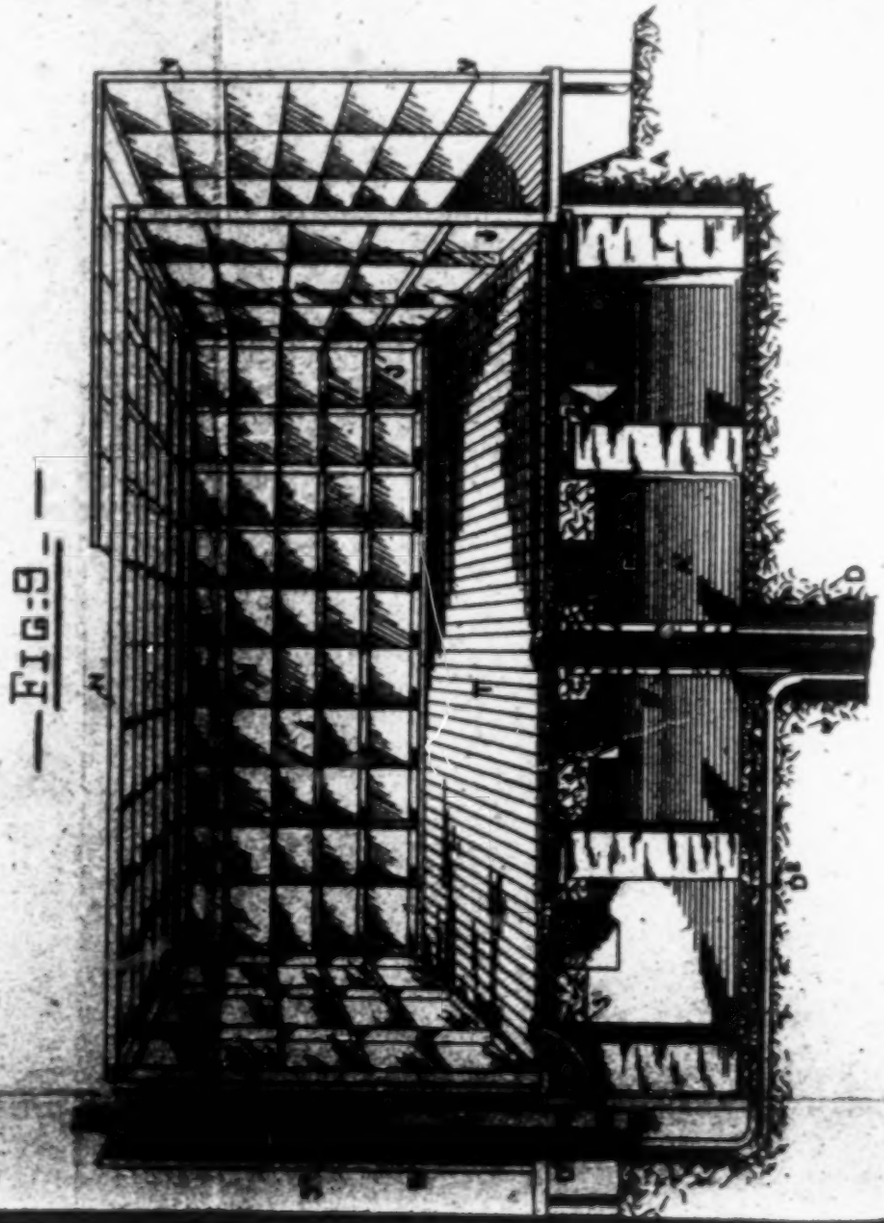
1086

(No Model.) 7 Sheets—Sheet 6.

W. VAN DER HEYDEN.

SANITARY HOUSE.

No. 504,544. Patented Sept. 5, 1893.



—Fig. 9.—

SANITARY HOUSE.

No. 504,544. Patented Sept. 5, 1893.

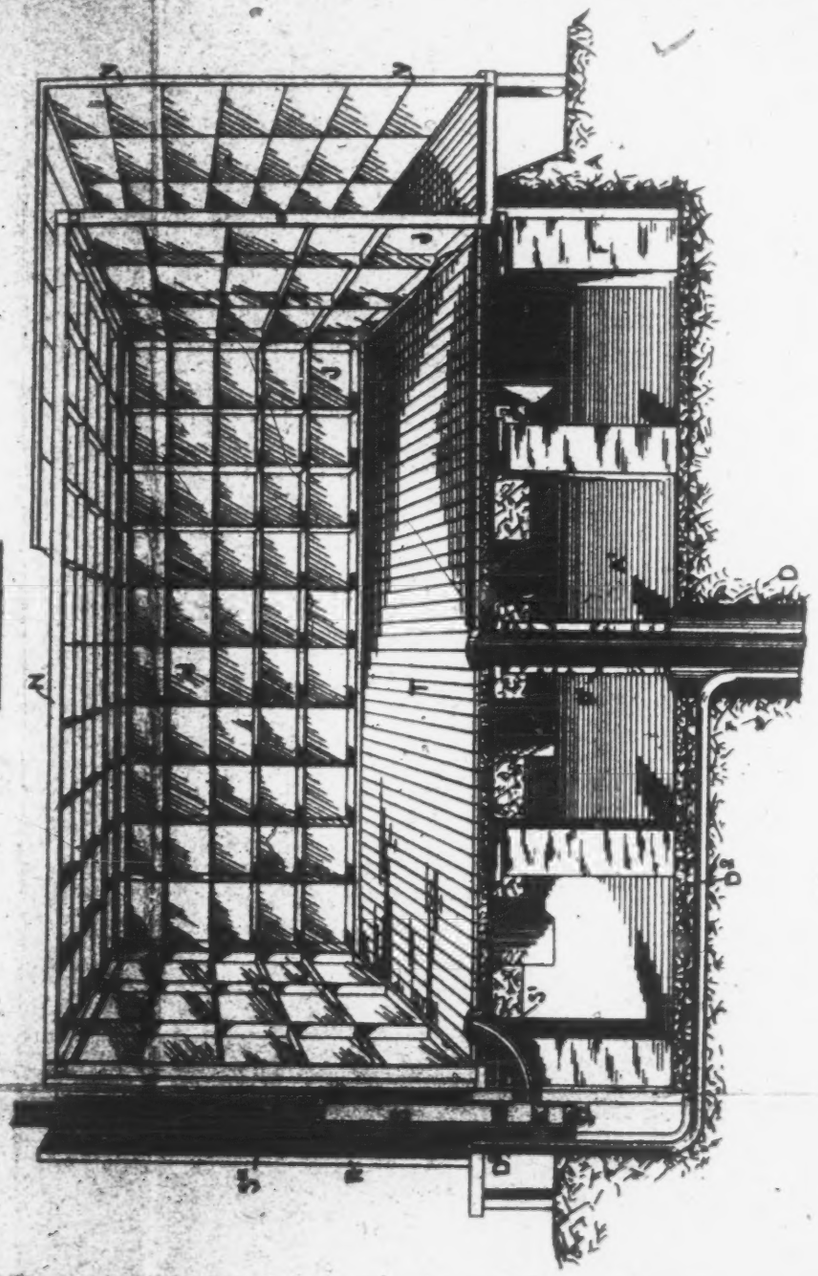


Fig. 9.

Witnesses
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W. van der Heyden
per Samuel W. Farrell
Atty

1087

(No Model.) 7 Sheets—Sheet 7.

W. VAN DER HEYDEN.

SANITARY HOUSE.

No. 504,544. Patented Sept. 5, 1893.

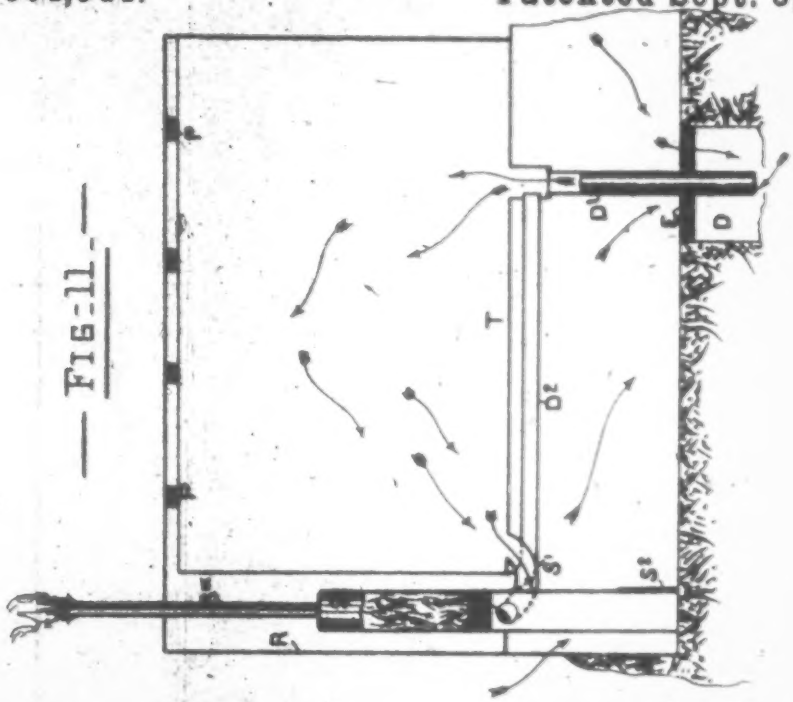

FIG. 11.

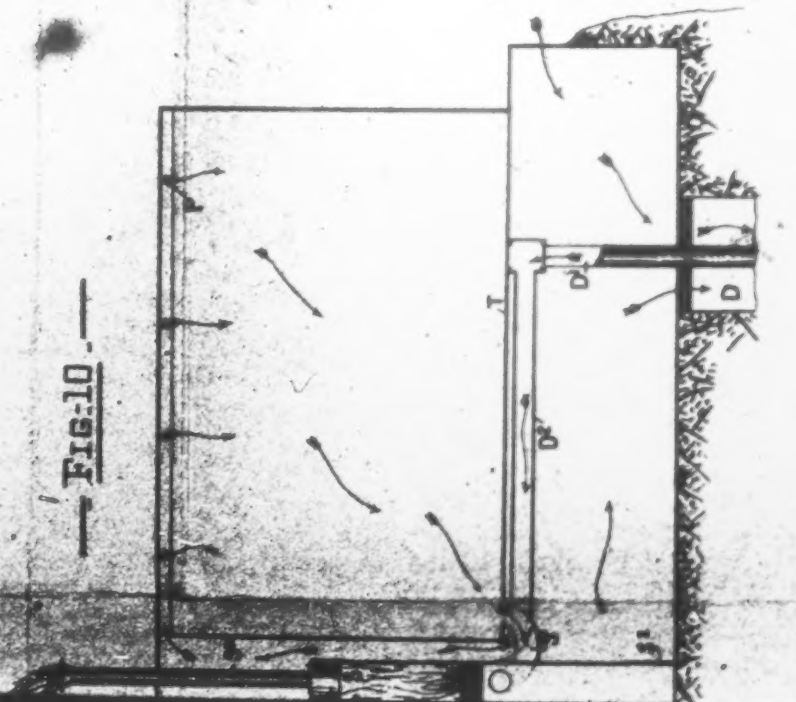

FIG. 10.

FIG-11

FIG-10

Witnesses
Chas. Schmidt
J. Stead

Inventor
W. van der Hayden
per Lemuel W. Serrell

UNITED STATES PATENT OFFICE.

WILLIAM VAN DER HEYDEN, OF YOKOHAMA, JAPAN.

SANITARY HOUSE.

SPECIFICATION forming part of Letters Patent No. 504,544, dated September 5, 1893.

Application filed December 13, 1892. Serial No. 454,977. (No model.) Patented in England September 10, 1891, No. 15,347.

To all whom it may concern:

Be it known that I, WILLIAM VAN DER HEYDEN, a subject of the King of Holland, residing at Yokohama, in the Empire of Japan, have invented certain new and useful Improvements in Houses, (for which a patent has been granted me in Great Britain, being dated September 10, 1891, No. 15,347,) of which the following is a specification.

My invention refers to the construction of houses as hereinafter described, which enable people to live hygienically both in the coldest climates and in the hottest countries, and my said invention consists of a building, the walls thereof being composed of boxes of particular construction as hereinafter described, having the vertical sides of the same formed of glass and transparent, and a transparent roof or ceiling similarly constructed, the space within or between the double transparent walls and roof being filled with water containing alumen in solution. In buildings thus constructed daylight penetrates to every part of the interior of the dwelling, while the alum solution contained by and within the thickness of the walls enables an always equal temperature to be maintained within the house, a temperature in fact equal to that of the ice introduced. It will thus be evident that in hot climates the introduction of cool [illegible], while in cold climates or cold [illegible] introduction of warmed air is desirable, there should therefore be provided [illegible] air at suitable temperatures, [illegible] I shall hereinafter describe [illegible] ventilation and warming [illegible] to answer the purpose, [illegible] in combination with such a construction of dwelling, although I do not lay any claim to such ventilating and warming [illegible] tion of Fig. 1. Fig. 3 is a vertical cross section about the line *x y* of Fig. 1, and drawn to a somewhat larger scale than the latter figure. Figs. 4 to 11 are views appertaining to the construction and arrangement hereinafter referred to.

Similar letters of reference refer to like parts in the several figures.

According to my invention I construct the building with a basement and an upper story, the said basement being situated under ground or inclosed by thick walls A.

Upon the pillars F located within the basement and upon beams F' supported thereon are standards G preferably of metal between which the walls extend, and according to my invention I make these walls double and of plate glass so arranged that between the two thicknesses of glass there remains a space. As this space is intended to contain water or a solution of a salt, as hereinafter described, the glass panes should be connected and arranged in such a way as to form water-tight closed boxes or cases, the said walls of the upper story or stories being composed of a number of such boxes or cases.

The construction of a box or case is shown at Figs. 4 to 7, Fig. 4 being a sectional perspective view showing two supporting metal uprights or columns G, and one of the boxes or cases supported thereby. Fig. 5 is a perspective view of one of the boxes separated. Fig. 6 is a vertical transverse section on the line *x' y'* of Fig. 4, and Fig. 7 shows the box with the frame and glass of one side removed, to show the interior.

Fig. 8 shows a sketch of two of the boxes or cases for the roof or ceiling as is necessary to explain the construction of the same.

Each box or case for the walls, see Figs. 5

SANITARY HOUSE.

SPECIFICATION forming part of Letters Patent No. 504,544, dated September 5, 1893.

Application filed December 13, 1892. Serial No. 454,977. (No model.) Patented in England September 10, 1891, No. 15,347.

To all whom it may concern:

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My invention refers to the construction of houses as hereinafter described, which enable people to live hygienically both in the coldest climates and in the hottest countries, and my said invention consists of a building, the walls thereof being composed of boxes of particular construction as hereinafter described, having the vertical sides of the same formed of glass and transparent, and a transparent roof or ceiling similarly constructed, the space within or between the double transparent walls and roof being filled with water containing alumen in solution. In buildings thus constructed daylight penetrates to every part of the interior of the dwelling, while the alumen solution contained by and within the thickness of the walls enables an always equal temperature to be maintained within the house, a temperature in fact equal to that of the air introduced. It will thus be evident that in hot climates the introduction of cool air is preferable, while in cold climates or cold seasons the introduction of warmed air is desirable. Means should therefore be provided for the supply of air at suitable temperatures, and for this object I shall hereinafter describe means for ventilation and warming which I have found to answer the purpose, when used in combination with such a constructed dwelling, although I do not lay especial claim to such ventilating and warming devices, except when fitted in houses constructed according to my invention.

In order that my invention may be readily understood, I will fully describe the same with reference to the accompanying drawings, which show, by way of example, as much of a house and its fittings as will be necessary to explain the construction and arrangement of the same.

Figure 1 is a horizontal section of the dwelling, the roof being removed. Fig. 2 is an end elevation of Fig. 1. Fig. 3 is a vertical cross section about the line *x y* of Fig. 1, and drawn to a somewhat larger scale than the latter figure. Figs. 4 to 11 are views appertaining to the construction and arrangement hereinafter referred to.

Similar letters of reference refer to like parts in the several figures.

According to my invention I construct the building with a basement and an upper story, the said basement being situated under ground or inclosed by thick walls A.

Upon the pillars F located within the basement and upon beams F' supported thereon are standards G preferably of metal between which the walls extend, and according to my invention I make these walls double and of plate glass so arranged that between the two thicknesses of glass there remains a space. As this space is intended to contain water or a solution of a salt, as hereinafter described, the glass panes should be connected and arranged in such a way as to form water-tight closed boxes or cases, the said walls of the upper story or stories being composed of a number of such boxes or cases.

The construction of a box or case is shown at Figs. 4 to 7, Fig. 4 being a sectional perspective view showing two supporting metal uprights or columns G, and one of the boxes or cases supported thereby. Fig. 5 is a perspective view of one of the boxes separated. Fig. 6 is a vertical transverse section on the line *x' y'* of Fig. 5, and Fig. 7 shows the box with the frame and glass of one side removed, to show the interior.

Fig. 8 shows so much of two of the boxes or cases for the roof or ceiling as is necessary to explain the construction of the same.

Each box or case for the walls, see Figs. 5 to 7, is composed of two similar cast iron or other metal frames H and H', and on these frames the glass panes J J are laid and fixed thereto by suitable cement applied in a fluid condition so that it fills up all the gaps and spaces left by any irregularities of the glass J or the metal frames H H'. A wood or other suitable frame I provided on both edges with a strip of rubber (or substance) I, Fig. 6, is interposed between the two metal frames H H', and bolts K K' are passed through the corners of the metal frames H H' so as to pass

outside door of the frame K, as clearly shown at Fig. 7; by these bolts the frames H H' are held together pressing against the frame K and thus pressing the elastic strips against the glass panes J J in such a manner as to insure an air and water-tight joint.

The frame K should be prepared by being painted and varnished or otherwise, so that no fluid may be absorbed by it. The water or solution is let in through an opening H' on the top of the metal frames and another opening H² is provided for the escape of the air; both of the said openings H' H² are closed by, for example, a wood plug, after the filling. The boxes so formed rest on steps G' formed on the cast iron or steel uprights or columns G, shown at Fig. 4, which latter are formed with a foot G² by means of which they are secured by screws or the like to the beams F' resting directly on the aforesaid stone pillars F.

I do not confine myself to the precise arrangement of the uprights shown, such being matters of construction, the design of which must be varied to suit the style of architecture, and the details of the said columns may be varied to suit requirements; thus, one of the side flanges thereof may be made removable, so that the boxes or cases may be readily removed for repair, or be placed in position without disturbing those adjacent, and other constructional parts may be varied somewhat to suit requirements and according to circumstances.

The floor uprights as well as the spaces between the boxes or cases should be covered with felt and over that with thin wooden [illegible] Fig. 4, in order to prevent [illegible] and these [illegible] both outside [illegible] a way that [illegible] The [illegible] forms [illegible] a steel-

the glass panes of the boxes of the walls and of the ceiling or roof I fill with a solution of kali alumen or ammonia alumen, which has the well known property of absorbing radiant heat. Supposing a temperature of the outside air in the tropical climates to be between 140° and 150° Fahrenheit or about 60° Celsius, I may to one hundred parts of water employ about fifty parts of alumen, that is half the weight of the water, or in some cases if found preferable I may use other salts, for instance sulphate of soda and others. The tiers of glass boxes or cases placed one above another to form the walls of the dwelling and supported on the steps of the metal column, see Fig. 4, do not reach up to the glass cases forming the ceiling, the columns being somewhat higher, a space is thus left between the top of the walls and the ceiling, and this I close by a woodwork molding. It is through this space and molding that heated air may be passed, from a heating apparatus into the chamber, and the air may also be caused to escape from the interior thereof through openings P, Figs. 3, 10 and 11, in the aforesaid molding. The various openings may each of them be closed if desired for the regulation of the influx or efflux of the warm air.

The floor T of the dwelling place proper should be made of wood of double thickness, the space between being filled with sawdust as shown at Figs. 3 and 9, while in the corners glass boxes W, Figs. 1 and 3, similar to those of the walls, are provided to admit light to the basement.

The entrance to the dwelling place is made by carrying several of the boxes such as compose the walls, in a hinged iron frame, as indicated at W', Fig. 1, this opening from the entrance chamber W² closed by another ordinary door W³, or in some cases entrance may be had by steps and an opening in the floor of the dwelling closed by a trap door, although this latter arrangement is not shown in the accompanying drawings; in both arrangements the doors should close air-tight.

In houses constructed as described, the

weight of the water, or in some cases if found preferable I may use other salts, for instance sulphate of soda and others. The tiers of glass boxes or cases placed one above another to form the walls of the dwelling and supported on the steps of the metal column, see Fig. 4, do not reach up to the glass cases forming the ceiling, the columns being somewhat higher, a space is thus left between the top of the walls and the ceiling, and this I close by a woodwork molding. It is through this space and molding that heated air may be passed, from a heating apparatus into the chamber, and the air may also be caused to escape from the interior thereof through openings P, Figs. 8, 10 and 11, in the aforesaid molding. The various openings may each of them be closed if desired for the regulation of the influx or efflux of the warm air.

The floor T of the dwelling place proper should be made of wood of double thickness, the space between being filled with sawdust as shown at Figs. 3 and 9, while in the corners glass boxes W, Figs. 1 and 3, similar to those of the walls, are provided to admit light to the basement.

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In houses constructed as described, the interior being closed to the outer atmosphere it is of course necessary to provide air, preferably cool air, or air and warmth according to circumstances, for the supply of the interior, and I will now describe means for effecting this object. The basement or "go-down" beneath the dwelling place, (and into which basement the sunlight does not enter) is formed with openings B B extending through from the interior to the open air; these openings B B are formed for the entrance of air, the latter being filtered as it enters, through cotton C, Fig. 3, with which the air apertures are packed, the said cotton being retained in position by gratings G G on either side. In the floor A′ of the basement there is a [illegible] D covered with a double iron grating [illegible] between which cotton E is placed, and a [illegible] D′ passes from the interior of the [illegible] through the grating and upward to a [illegible]

air of as constant a temperature as possible for the upper story of the house, the air being supplied to the well D from the atmosphere through the apertures B and the basement of the structure, all as hereinafter described. The basement may serve as a store room or "go-down" and where possible the well D may serve as a water supply.

Adjoining the house I provide a structure to contain the heating apparatus, which structure may be situated close to or entirely free from the house, and say to the south-west thereof. The heating structure consists of a building formed by double walls constructed as before described; that is to say, of double glass cases for containing liquid, excepting that in cold countries other materials than glass may be employed, and the walls may be solid and not contain liquid, and this structure may assume somewhat the form of a tower indicated by the letter R in the drawings, see Figs. 1, 2, 9, 10 and 11. Within this structure a stove S, Figs. 9, 10 and 11, is placed, an iron chimney S'' conveying the smoke through the roof of the heating tower R which latter is otherwise perfectly closed. The air within the tower R and around the stove becoming warmed, is conducted through suitable passages under the roof and passes through the aforesaid spaces P in the wooden molding aforesaid into the dwelling, while the tower R is supplied with fresh air by a separate pipe D' from the well, as at Fig. 9, or by a branch D^1, Figs. 1, 10 and 11, of the pipe D' before mentioned coming from the basement or well D in same, this entering at the floor of the tower R, Figs. 10 and 11, near the stove S but not communicating with same. The air in the tower R cannot communicate in any way with the interior of the stove. The air to serve for the combustion of the fuel in the stove S, passes through a tube S' from the interior of the dwelling having entered there for the respiration of the inmates, the tube S' passing through the floor of the dwelling place. The cylindrical portion of the stove may be continued through to the basement, as is shown at Figs. 10 and 11, where the ashes may be removed through a door S' usually closed, or the stove casing may be continued partially into the basement, as at Fig. 9, and be provided with a movable bottom as at S' in the figure. The stove is supplied with fuel through a funnel feeding device and the heat of the sun warms the air inside the iron tube which air will rise and must then necessarily be replaced by the air from the room. The carbon coating of the tube, when such is employed, absorbs heat and will give this off during the night continuing to cause thereby the circulation of air. When the weather is cold and the stove S is in action, air passes to the stove from the upper room by the tube S' and the upper room or dwelling place is supplied from the tower R, which obtains filtered air by the tube D' from the basement or well D. The diagram Fig. 10 clearly shows the direction of the air currents under the latter conditions by means of the arrows therein shown. In warm weather the heat of the sun acting on the iron chimney draws air through the stove from the dwelling, or the stove may be put in action, as is shown at diagram 11 with the same effect; the stove then receives its supply of air from the pipe S' aforesaid, air being drawn into the dwelling place through the tube D' from the well D, wherein as is well known the temperature is nearly constant. In the latter case the apertures P at the upper part of the dwelling place are closed as also is the tube D^2, while the opening of the tube D' in the floor T which was previously closed, is now opened; the well D as aforesaid receives its supply of air through apertures B and filtering partitions C C', E E', the directions of the currents being shown by the arrows Fig. 11.

In some cases where desired, the mechanical action of fans or like apparatus may be employed to promote circulation of air.

The solution of alumen does not readily freeze, but where this is likely, as in arctic regions, I may surround the house with a glass casing V, partly shown in Fig. 9, leaving a space which may contain warmed air supplied from the heating tower or vapor of water or ethereal oils.

I claim as my invention—

1. A building having the walls built up of water-tight boxes each filled with a solution of alumen, the exterior and interior vertical sides of the boxes being formed of glass, rendering the walls translucent, columns G by which the tiers of superposed boxes are supported, horizontal beams O carried on the said columns G for supporting the roof or ceiling, a translucent ceiling or roof composed of double-glass panes N, N' containing alumen

...re may be situated close to or entirely free from the house, and say to the south-west thereof. The heating structure consists of a building formed by double walls constructed as before described; that is to say, of double glass cases for containing liquid, excepting that in cold countries other materials than glass may be employed, and the walls may be solid and not contain liquid, and this structure may assume somewhat the form of a tower indicated by the letter R in the drawings, see Figs. 1, 2, 9, 10 and 11. Within this structure a stove S, Figs. 9, 10 and 11, is placed, an iron chimney S'' conveying the smoke through the roof of the heating tower R which latter is otherwise perfectly closed. The air within the tower R and around the stove becoming warmed, is conducted through suitable passages under the roof and passes through the aforesaid spaces P in the wooden molding aforesaid into the dwelling, while the tower R is supplied with fresh air by a separate pipe D' from the well, as at Fig. 9, or by a branch D^2, Figs. 1, 10 and 11, of the pipe D' before mentioned coming from the basement or well D in same, this entering at the floor of the tower R, Figs. 10 and 11, near the stove S but not communicating with same. The air in the tower R cannot communicate in any way with the interior of the stove. The air to serve for the combustion of the fuel in the stove S, passes through a tube S' from the interior of the dwelling having served there for the respiration of the inhabitants, the tube S' passing through the floor T of the dwelling place. The cylindrical portion of the stove may be continued downward to the basement, as is shown at Figs. 10 and 11, where the ashes may be removed through a door S^2 usually closed, or the stove casing may be continued partially into the basement, as at Fig. 9, and be provided with a movable bottom as at S^3 in the latter figure. The stove is supplied with fuel from above through a funnel feeding device, the position of which is indicated at U, Fig. 1, and this should be provided with a balance valve for closing the same when not in use.

The double walls of the tower R may in hot climates be filled with water or solution of iodine, and in such circumstances the chimney may be coated outside with lamp-black to absorb heat, and thus keep up the circulation, or the stove may in warm climates be replaced by a simple iron tube which is painted outside with a layer of carbon

dwelling place is supplied from the tower R, which contains filtered air by the tube D^2 from the basement or well D. The diagram Fig. 10 clearly shows the direction of the air currents under the latter conditions by means of the arrows therein shown. In warm weather the heat of the sun acting on the iron chimney draws air through the stove from the dwelling, or the stove may be put in action, as is shown at diagram 11 with the same effect; the stove then receives its supply of air from the pipe S' aforesaid, air being drawn into the dwelling place through the tube D' from the well D, wherein as is well known the temperature is nearly constant. In the latter case the apertures P at the upper part of the dwelling place are closed as also is the tube D^2, while the opening of the tube D' in the floor T which was previously closed, is now opened; the well D as aforesaid receives its supply of air through apertures B and filtering partitions C C', E E', the directions of the currents being shown by the arrows Fig. 11.

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The solution of alumen does not readily freeze, but where this is likely, as in arctic regions, I may surround the house with a glass casing V, partly shown in Fig. 9, leaving a space which may contain warmed air supplied from the heating tower or vapor of water or ethereal oils.

I claim as my invention—

1. A building having the walls built up of water-tight boxes each filled with a solution of alumen, the exterior and interior vertical sides of the boxes being formed of glass, rendering the walls translucent, columns G by which the tiers of superposed boxes are supported, horizontal beams O carried on the said columns G for supporting the roof or ceiling, a translucent ceiling or roof composed of double glass panes N' N' containing alumen solution between the same, a double wood flooring T having an inter-space filled with sawdust or non-heat conducting substance, and walls A and pillars F for supporting the structure, whereby a building is produced into which daylight penetrates to every part, while the walls, roof and flooring are practically impermeable to heat or cold, as set forth.

2. Boxes or cases for building translucent walls of dwellings, each composed of two metal frames H H', two plate glass panes J J fixed into the frames H H', a wood or other frame

K provided on each side with rubber packing L L, for interposition between the glass panes H H', held by metallic bands, both frames H H' to hold the glass together and cause the rubber packing L to press onto the glass panes and preserve a water-tight joint, and apertures I I' for filling the box with a solution of alumen, as set forth.

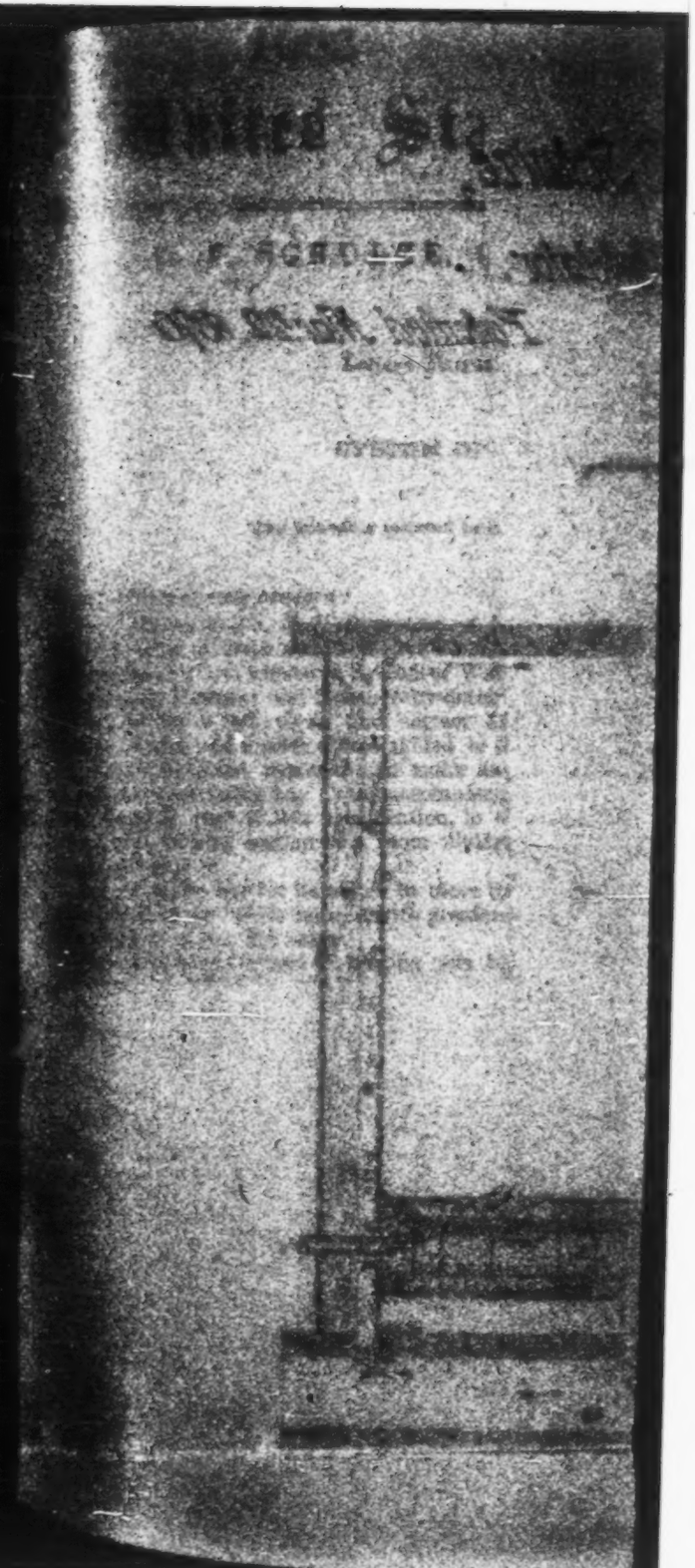
3. The combination in a building, of walls and roof built up of glass-sided boxes or cases filled with alumen in solution, the said walls and roof being translucent, a double floor T with inter-space thereof filled with non heat conducting material, and an inclosed or underground basement beneath the floor T; apertures B in the basement walls with filtering medium C for admitting air to the basement, a well D in the floor of the basement, filtering grating E E' for filtering air admitted to the well from the basement, and a pipe D' from the well into the upper dwelling place to supply air of an equable temperature from the well to the dwelling place, as set forth.

4. The combination in a building having the walls and roof built up of glass-sided boxes of same filled with alumen solution, the said walls and roof being translucent, of a double floor T, the inter-space therein packed with non heat conducting material, and a [illegible]-closed or underground basement beneath the floor T, and basement walls with apertures B and filtering medium C for admitting air to the basement, a well D in the floor of the basement, filtering grating E E' for filtering air admitted to the well from the basement, a stove S in out building R, pipe S' to conduct used air from the dwelling place to supply combustion, and pipes D' D² to conduct air from the well to be heated by passing around the stove, and passages P by which fresh air enters the said dwelling place, as set forth.

5. The combination in a building having walls and roof, of boxes introduced in the walls and having glass sides and containing a solution of alumen for admitting light and intercepting heat rays, substantially as specified.

W. VAN DER HEYDEN.

Witnesses:
R. A. MEEKS,
T. ISHUIRE.



C. F. Schulze,

Architect.

No. 101,[illegible] Patented Mar. 22. 1870

United States Patent Office.

G. F. SCHULZE, OF JANESVILLE, WISCONSIN.

Letters Patent No. 101,163, *dated March* 22, 1870.

SYSTEM OF HEATING AND VENTILATING.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, G. F. SCHULZE, of Janesville, in the county of Rock and State of Wisconsin, have invented a new and improved System of Warming and Ventilating Houses; and I do hereby declare the following to be a full, clear, and correct description thereof, which will enable others skilled in the art to which my invention appertains to make and use the same, reference being had to the accompanying drawings forming part of this specification, in which the figure is a vertical section of a room illustrating my improved system.

My invention has for its object to more thoroughly heat dwelling and other houses, with greater economy of fuel than is now the case.

The primitive method of heating was by an open fire-place, of which the modern grate is a variation. While luxury has preserved the latter, economy has long since abandoned it. The fire-place was followed in progress by the common stove, which possesses the merit of radiating the heat from all sides. Without other appliances, and without intelligent direction and control of the heat, the stove is a defective and expensive medium for heating purposes.

The common stove radiates the heat but a short distance, warming only that portion of the air immediately surrounding it, which, as it becomes heated, is expanded, and ascends, and is followed by a current of cold air from the floor of the room. This, in its turn, becomes heated and rises, thus producing a constant current of heated air. This current, however, is either confined to a narrow space immediately surrounding the stove, leaving the remote parts of the room cold and uncomfortable, or fills the upper part of the room only, while a current of cold air next the floor, so that the feet are surrounded by cold air, whilst the head and upper parts of the body are exposed to a dry, hot

[illegible] the method of heating by the common [illegible], is remedy should have [illegible] attention seems to have been drawn

ing became confounded, so that about the same quantity of partially cooled air is now withdrawn and wasted from a dwelling with few occupants, not for ventilation, but in order to warm the same, as is expelled from an equal-sized dwelling with many occupants, when the expulsion may be justified on account of ventilation.

This leads to the inquiry why ventilated and only partially-cooled air is wasted. This partially-cooled air is much warmer than that outside the dwelling, and should be returned to the furnace and reheated, instead of heating the extreme cold air from without.

My invention, therefore, consists in producing a circulation of heated air from a heater or furnace through the space to be heated, and, after being partially deprived of its caloric, back to the furnace to be reheated, the circulation being continued indefinitely, or until the air becomes vitiated, when it is discharged, and fresh air introduced.

The accompanying drawings represent the section of a dwelling-house, of which—

A is a room;
B, the floor;
C, the ceiling;
D, the ceiling of a lower room; and
E, an outside wall.

The floor B is raised slightly above the lower ceiling D, to leave an air-space, F, between them, which communicates at one end with the room A, and at the other end with the [illegible] or chimney, G.

H is a hollow cylinder, open at both ends, placed vertically within the room A, surrounding the stove, furnace, or other heater I, and communicating at its lower end with the space F [illegible] floor.

J is a pipe connecting the [illegible] cylinder with the outer air, or arranged in any suitable manner to supply cold air to the heater [illegible]

It is provided with a valve or damper, K, by which the supply of cold air is [illegible]

L is also a valve or [illegible] the flue G, by which communication is opened or closed between the room

SYSTEM OF HEATING AND VENTILATING.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, G. F. SCHULZE, of Janesville, in the county of Rock and State of Wisconsin, have invented a new and improved System of Warming and Ventilating Houses; and I do hereby declare the following to be a full, clear, and correct description thereof, which will enable others skilled in the art to which my invention appertains to make and use the same, reference being had to the accompanying drawings forming part of this specification, in which the figure is a vertical section of a room illustrating my improved system.

My invention has for its object to more thoroughly heat dwelling and other houses, with greater economy of fuel than is now the case.

The primitive method of heating was by an open fire-place, of which the modern grate is a variation. While luxury has preserved the latter, economy has long since abandoned it. The fire-place was followed in progress by the common stove, which possesses the merit of radiating the heat from all sides. Without other appliances, and without intelligent direction and control of the heat, the stove is a defective and expensive medium for heating purposes.

The common stove radiates the heat but a short distance, warming only that portion of the air immediately surrounding it, which, as it becomes heated, is rarefied, and ascends, and is followed by a current of cold air from the floor of the room. This, in its turn, becomes heated and rises, thus producing a constant current of heated air. This current, however, is either confined to a narrow space immediately surrounding the stove, leaving the remote parts of the room cold and uncomfortable, or fills the upper part of the room only, leaving a current of cold air next the floor, so that the feet are surrounded by cold air, while the head and upper parts of the body are exposed to a dry, hot temperature.

These defects in the method of heating by the common stove being recognized, a remedy should have been found, but attention seems to have been drawn to some other evil, in the efforts to cure which an economical and thorough system of heating was entirely overlooked.

Ventilation then became the object sought after. This, it was found, consisted in the introduction of fresh air and the expulsion of vitiated air. In order to prevent the introduction of cold air directly into a room, it was first carried to a furnace, and from thence conducted into the room or rooms through pipes or flues for conveying heated air from the furnace to the rooms caused the discovery that, to introduce a quantity of heated air into a room, the expulsion of an equal quantity of the air already in the room became necessary. At this point ventilation and heating became confounded, so that about the same quantity of partially cooled air is now withdrawn and wasted from a dwelling with few occupants, not for ventilation, but in order to warm the same, as is expelled from an equal-sized dwelling with many occupants, when the expulsion may be justified on account of ventilation.

This leads to the inquiry why unvitiated and only partially-cooled air is wasted. This partially-cooled air is much warmer than that outside the dwelling, and should be returned to the furnace and reheated, instead of heating the extreme cold air from without.

My invention, therefore, consists in producing a circulation of heated air from a heater or furnace through the space to be heated, and, after being partially deprived of its caloric, back to the furnace to be reheated, the circulation being continued indefinitely, or until the air becomes vitiated, when it is discharged, and fresh air introduced.

The accompanying drawings represent the section of a dwelling-house, of which—

A is a room;
B, the floor;
C, the ceiling;
D, the ceiling of a lower room; and
E, an outside wall.

The floor B is raised slightly above the lower ceiling D, to leave an air-space, F, between them, which communicates at one end with the room A, and at the other end with the flue or chimney, G.

H is a hollow cylinder, open at both ends, placed vertically within the room A surrounding the stove, furnace, or other heater I, and communicating at its lower end with the space F beneath the floor.

J is a pipe connecting the interior of the cylinder with the outer air, or arranged in any suitable manner to supply cold air to the heater when desired.

It is provided with a valve or damper, *a*, by which the supply of cold air is introduced or cut off.

b is also a valve or register in the flue G, by which communication is opened or closed between the space F and said flue G.

The smoke and products of combustion are discharged from the heater into the flue G by means of the pipe K, in the usual manner.

The operation is as follows:

As the furnace I becomes heated, the air within the cylinder H is also heated, and rises against the ceiling C of the room. This is followed by a current of cold air from the space F, which, in its turn, also rises, and is discharged through the cylinder into the room.

The heated air so escaping from the cylinder moves along the ceiling C to the outside wall E, and in its passage becomes cooled sufficiently to cause it to descend to the floor, beneath which it is allowed to pass

back again to the heater, to be reheated and again discharged into the room. By this means a constant circulation is produced in the direction of the arrows, thoroughly warming all parts of the room.

When the air becomes vitiated, the valve *a* in the supply-pipe J and the valve *b* in the flue G are opened, the former to admit fresh air around the heater, and the latter to permit the discharge of vitiated air from the room A through the space F into the flue. Such vitiated air is caused to ascend the flue, as shown by the arrows, being heated by contact with the pipe K from the heater. These operations are continued alternately, as will be readily understood.

It must, however, be borne in mind that the heating of the room is continued during the ventilating process, so that it will not be subjected to sudden changes in temperature.

Several rooms may be heated by my improved system from the same heater, which may be placed in any preferred story of the building or other structure.

It is requisite, however, to connect the room to be warmed with the hollow cylinder surrounding the heater, and the space below the floor with the bottom of the cylinder, this vertical air-shaft or cylinder being principally the cause of the circulation.

I do not confine myself to any specific arrangement for distributing the heated air, as it may be varied indefinitely without departing from the principle of my invention.

Having thus described my invention,

What I claim as new, and desire to secure by Letters Patent, is—

The application of a hollow vertical air-shaft to a heater within the room to be heated, for the purpose of causing a constant circulation of heated air from the furnace through the space to be heated, and, after being partially deprived of its caloric, back to the heater to be reheated, continuing indefinitely, in combination with a ventilating process by which the vitiated air is expelled from the room or rooms, and cold air introduced, during the operation of warming, as herein shown and described.

G. F. SCHULZE

Witnesses:

A. A. JACKS,

S. HOLDREDGE, Jr.

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Technical World Magazine

HENRY M. HYDE, Editor R. T. MILLER, Jr., Publisher

Cover Design—George Brehm

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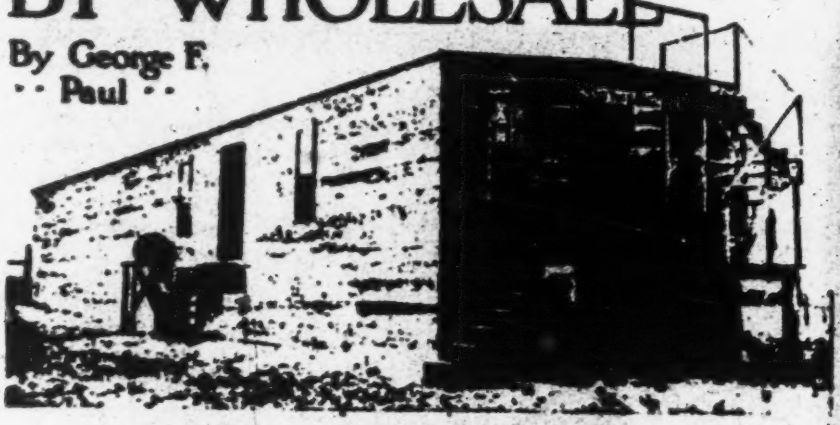
HATCHING CHICKENS BY WHOLESALE

By George F. Paul



THE 150,000 EGG HATCHERY AT PORT CONNOR, TEXAS
The remarkable feature of this building is its smallness as contrasted with its capacity

THERE is now in operation at Port O'Connor, Texas, a machine that is capable of turning out a chicken every twelve seconds for twenty-four hours a day, and for three hundred and sixty-five days in a year. This mammoth hatchery is the third of its type built by the inventor, who was formerly a poultry expert for the Government. It is the second largest hatching establishment in the world, being slightly exceeded in capacity by a hatchery at Petaluma, California, which holds 165,000 eggs as against 150,000 in the Texas machine.

Perhaps the most remarkable feature of this plant is the fact that all the eggs together with room for candling, chick packing, and all engines, fans, and equipment, occupy but a single floor sixteen by fifty feet. Furnished with common incubators, such a room would have just about the same capacity in three weeks as this plant has in a single day.

This wonderful economy of space and cost is attained by placing the eggs in superimposed trays like the type cases in a printer's case rack, or the trays in a fruit dryer. This idea has been tried before but was not a success on account of the hot air rising. In the present instance, this difficulty is overcome by forcing a continual current of air from a centrifugal fan through the hatching chamber, which serves to keep it at an even temperature throughout. While this is quite an item of expense and would not pay with a small machine, yet in a big plant it is paid for several times over by the saving of the duplication of the small machines, as well as by the economy of the fuel and labor.

One of the unique improvements in the Texas plant is a turning system, by which compartments holding 10,000 eggs are swung on a pivot and the eggs turned by inverting the entire compartment. This enables one man to turn 100,000 eggs in less than two minutes. These eggs are ventilated and maintained at an equal temperature by an eight hundred pound centrifugal fan, requiring four horsepower to operate it, and the temperature is regulated to a tenth of one degree, while water sprays regulate the moisture to a similar nicety.

The eggs are not cooled from the time they enter the hatchery until they leave

SOME OF THE TRAYS OF EGGS

the inventor believing that cooling is injurious. The eggs need be handled but three times; first, when put into the machine; second, when tested; third, when the chicks are taken off and boxed for shipment. With such a plant one man can do the work of five men running small incubators, or of ten thousand setting hens.

The most obvious question asked by the visitors at the plant is, "Where will you get the eggs?" The reply is that they will be purchased from the larger poultry breeders throughout the Southern and Middle Western States. These breeders will ship in case lots at much lower rates for eggs and for transportation than is the case of the petty sales of one or two settings. Thus the hatchery becomes the quickest and cheapest way to stock up a new country with pure bred poultry. If pure bred eggs cannot be secured in sufficient quantities, hackney wagons will be sent through the heavy egg-producing districts in the counties to the north. Lavaca is the banner poultry county of Texas.

A 30,000-egg hatchery built last year in Oklahoma was filled by March first and thereafter turned eggs away. This plant shipped chicks through a radius of five hundred miles. Many of the Eastern poultry plants ship chickens to practically every State in the Union and the plants on the Pacific coast ship as far east as Colorado. The manager of the Port O'Connor plant expects to confine his business to Texas, which is today one of the best markets known for baby chicks and is so far removed from the other large hatcheries that the expense and losses in shipping prove a serious handicap.

Inexperienced people ordinarily expect better results from artificial incubation than are secured in actual practice. This is perhaps due to the advertisements of some incubator manufacturers. Farm eggs sent to the hatchery run from fifty to seventy-five per cent hatches of all eggs entered. City-bred stock varies greatly. Occasional lots of Leghorn eggs hatch upwards of eighty per cent. Eggs from heavy breeds are often at the opposite extreme and in some instances eggs are sent to the hatchery that fail to produce a chick.

Custom handling for poultry fanciers is likely to be unsatisfactory. The chief business of the hatchery will be that of producing baby chicks for outside sale and hatching eggs for local commercial poultry growers.

The local promoters hope by the help of this giant hatchery to build up a poultry community on the Texas coast very much like those hatcheries of California where, in some localities, notably Petaluma, poultry raising is the chief industry and has proved very profitable, incomes of as high as three thousand dollars a year being made off of ten acres.

NOW 4 Models at Much Lower Prices

Smith again Sets the pace . . .

The Smith Incubator has been acknowledged as the leading machine since the commencement incubator became a factor in the hatching industry. As conditions changed from time to time, changes were made in the machines. Now—Smith comes out with 4 models, each designed to fill a definite place in the industry. And with a price on each which is below any price ever before offered. We especially call your attention to the New Intermediate 30,000-egg machine and also the New Giant 64,000-egg capacity, which are in addition to the Smith JUNIOR 10,000-egg capacity and the Old Reliable 52,000-egg capacity.

The new GIANT Smith 64,000 offers 25% more egg capacity than the widely known, popular OLD RELIABLE Smith 52,000 and is only 3 feet longer—same width and height. It is the largest and by far the most compact incubator made.

The new INTERMEDIATE Smith 30,000 offers nearly one-third more capacity than the Smith JUNIOR 10,000 and is only 2 feet longer—same width and height.

A Capacity to Fit Your Needs

PRICES REDUCED

In line with the times, The Smith Incubator Company announces a drastic price reduction. Never before in the history of the hatchery industry has it been possible to obtain Smith machines at such low prices. You owe it to yourself to make a comparison between Smith's new low prices and the cost of equal egg capacity of any other incubator. Keep in mind too that Smith pays the freight and installs free of charge. No matter what your hatchery problems may be—it will be worthwhile to discuss them with a representative of The Smith Incubator Company.

Steam or Electric

Smith Service

Every Modern Device Necessary to Successful Incubation

THE SMITH INCUBATOR CO.
CLEVELAND, OHIO

USED INCUBATORS

Dependable, used machines of all standard makes for sale at reasonably low prices—new and slightly worn as new. These machines have been taken in trade on new Smiths. Many have reconditioned and put in good working order.

TERMS

We offer you the most liberal terms on all Smith models. The cash payment is small and you have 1 years to pay the balance. If you want to dispose of your present used equipment we will take it in trade on New Smiths. Mail the attached card for full information.

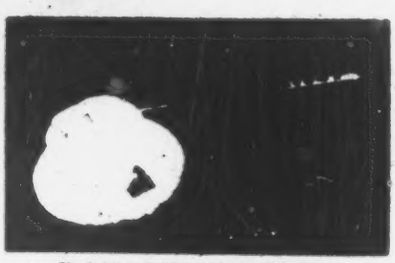
DEFENDANT'S EXHIBIT No. 16 1098

A CHICK CHILLED IN HATCHING IS LIKELY TO DIE

Every poultry raiser and every hatcheryman has had experience with chicks that have been chilled in brooding. The results of such chilling are common knowledge. However, not every hatcheryman realizes that at hatching time a chick can be so chilled in a few minutes that its life is endangered. Do you realize that a wet chick exposed to hatchery room temperature and humidity unconsciously is subjected to a chilling temperature that equals the wet bulb reading of that room? In less than five minutes a chick is thoroughly chilled to ruination. In ten such less than five minutes' exposure, it receives a tremendous shock. The chick will not die at once and the hatchery operator may not even recall the chilling which was given the chick. However, losses may occur a week or so later as a result of this chilling, and the hatcheryman pays the bill either through replacement or a lost customer.

Hatcherymen have noted a great variation in livability even where percentages of hatch was the same and where other conditions seem the same except the type of incubator used. It will pay you to investigate this phase of hatchery operation for replacement costs are a real item to the hatcheryman.

Not in Boastful Pride, but with a feeling of service to the industry do we point out that no other Incubator can possibly give the hatching chick the protection given by the Smith Incubator

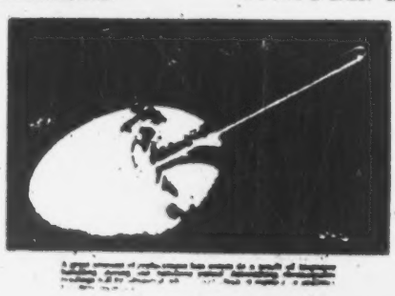


The Smith Incubator Never Chills Chicks

The Smith Incubator is so constructed that the chicks are not for any instant exposed to improper changing of temperature and humidity. Every instant, from the time the egg is opened until the completely dried chick is carried from the incubator, a warm, moist atmosphere surrounds the hatching eggs and temperature prevails closely as should be the case. If a tray of hatching chicks is carried from the incubator into the ordinary hatchery room, many of the chicks will be damaged. That is what happens in other types of incubators where the trays are pulled out into the hatchery room for work or for inspection. No one ever removes a hatching tray from the Smith Incubator into the hatchery room atmosphere. The Smith is built so that it preserves the chicks at all times. It is the only incubator so constructed.

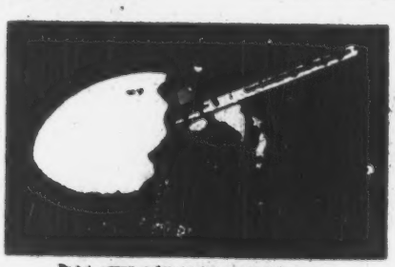
Smith Machine Easy to Fumigate

Most successful hatcherymen are fumigating regularly and thus prevent disease spread. Remember that disease spreads in the incubator only at hatching time and those germs are only released after the chick pips the shell. Fumigating in a separate hatcher or in any other type of an incubator will not prevent the disease germs from being released from infected chicks when they hatch. Proper fumigation will kill these germs before the chick dries and before the germs can be carried to other chicks. Disease germs are tiny, invisible specks which ride on dust particles or "down". The "down" itself, which is always present where chicks are hatching, is not harmful to the chicks. The germs of disease which are a problem in commercial hatcheries will not infect eggs in any stage of incubation. They can only infect chicks after they pip the shell. Anyone who tells you that a separate hatcher or any type of an incubator will prevent the spread of disease is either trying to mislead you or is not familiar with natural conditions and the facts. The germs are present in any type of a hatchery where diseased chicks are hatching. The question is merely one of getting rid of these germs when they are released, and fumigation is the only answer to this question that has been found. It is simple and easy in the Smith but not in all other types—in some makes it is impossible. The end is to be attained by assurance that fumigation is harmful to the chicks. On the contrary, if properly done to a Smith it is actually beneficial and increases livability. The Smith Incubator is so constructed that the fumigating gases are carried quickly and uniformly to every part of the machine. The whole process is under control at all times, and it is not necessary to open the machine to carry on the work. The Smith Incubator has proven to be more easily and effectively fumigated than any other incubator made.



Down to 80 Degrees in Ten Minutes

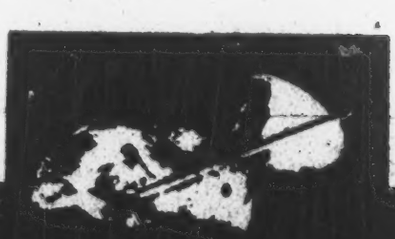
When we put a carefully graduated clinical thermometer in the rectal opening of a hatching chick under varying conditions, we discovered facts which are hardly believed everywhere. But chicks resented chilling has proved to be correct. We found that a wet chick, just as it comes from the shell, is highly susceptible to chilling. In experiments we exposed chicks that had just rolled out of the shell to a hatchery room temperature of 80 for ten minutes. At the end of this ten minute period, we found that these newly hatched chicks were chilled 20 or more and, in many cases, the body temperature was as low as 80. The above temperatures were taken by inserting special clinical thermometers on the rectum. It is not necessary for us to tell you the first that such chilling carries the utmost danger to the life of the chick. Even though chicks may not result, growth is retarded and losses are bound to follow. Can you afford to produce chicks which are not protected at all times from chilling temperatures?



Smith Users Get the Benefit

We are carrying forward at all times in the Smith Incubator plant tests on the best methods of handling baby chicks from the time the egg is set until the chick is in the hands of the customer. Our fumigation recommendations are the result of years of careful research and test. Our recommendations on the proper handling of the chick at hatching time are the result of most careful scientific work. Our methods regarding the separate hatcher comes as a result of years of testing.

The Smith Incubator Company not only manufactures incubators—it studies hatchery methods and results, has problems and the success of a Smith Incubator profits as a result.



Because of all these things Smith Users Profit Most

1390

PAID

Smith Engineering Brains

Dr. S. B. Smith
The man behind the Mammoth Incubator Idea

Developed the Mammoth Incubator Idea

• • •

Devised the first Smith Machine

• • •

Improved the Machine year by year keeping it always the best in the field

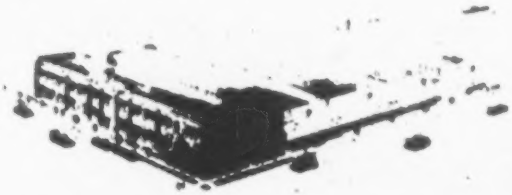
• • •

Developed and Demonstrated the Battery Brooder Method of Handling Surplus Chicks

• • •

Originated Many New Methods in Handling Both Chicks and Eggs Which Add to Hatchery Profits

Now make announcements in this folder which are of Utmost Importance to Hatcherymen



More Sound Ideas for the Hatcherymen Have Been Developed in this factory than in any other place in the world . . .

1390

The Answer to the separate Hatcher question is →

All sorts of rumors have been floating around the hatchery industry concerning our attitude toward a separate hatcher. Some have stated that we proposed bringing one on the market such a machine. We have no intention whatever of bringing a separate hatcher on the market. We have definite reasons supported by scientific research for taking this stand. We are thoroughly convinced that the hatcherymen is better off from any standpoint without a separate hatcher. The majority of hatcherymen give no sound reason for a separate hatcher. They have not asked for it, and do not want it.

1. Our Research Department says "NO"

When the separate hatcher was first announced, and desiring to maintain our place of leadership in all phases of hatchery practice, we immediately proceeded to investigate its merits and the attitude of hatcherymen toward it. We tested out various types of hatchers. We built in our own plant, the best separate hatchers ever made. We tested them thoroughly. We studied them from the standpoint of quality of chicks produced—percentage of hatch—from the standpoint of production costs and from every standpoint of hatchery operation. In every case we found every type of separate hatcher a handicap instead of a help. Our Research Department today is unalterably opposed to a separate hatcher of any type as an investment by man.

2. Our Field Men say "NO"

In order to make a double check on the separate hatcher question we sent our field men to call on users of separate hatchers and others in the hatchery field. We found an overwhelming sentiment against the separate hatcher. It adds to the cost of producing chicks and lays greater financial burden on the hatcherymen who is already heavily laden with items of expense. We have yet to find a single hatcherymen who can demonstrate that chicks produced in a separate hatcher are any better than, if as good as, those produced in a Smith machine.

3. Our Sales Department says "NO"

The Smith Incubator Company has consistently introduced improvements in both mechanical equipment and methods of operation. Each change, however, has been made after most careful scientific testing and nothing has been offered the industry until it has stood most rigorous trials. Our Sales Department is not in favor of bringing something on the market simply to have something to sell. Our equipment stands by all brands in the guarantee for we realize that unless a purchaser makes money with the equipment, the sale will prove to be a hamstring in the long run. For that reason, our Sales Department has said that they do not want to offer a separate hatcher They do not believe it has any place in the commercial production of baby chicks.

1391

NO!

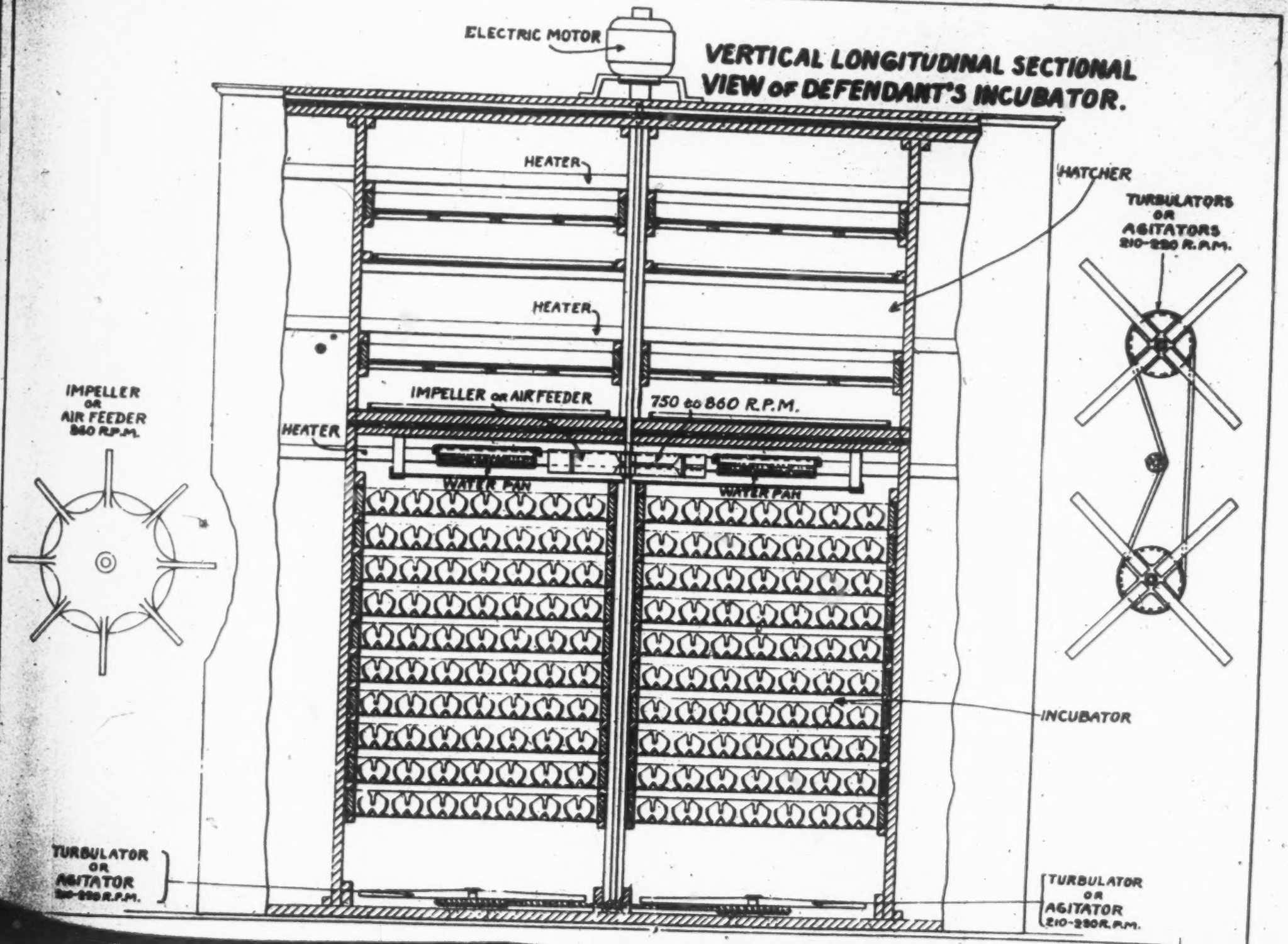
The Separate Hatcher Has No Place in the Hatchery Industry

Our tests have conclusively shown that a separate hatcher adds to the labor cost because the chicks and eggs must be handled more frequently. Separate hatchers add to the chances for exposing the chicks to damaging temperature and humidity changes. We have not found any separate hatcher which will add to the quality of chick produced---nor will it produce any greater per cent of hatch.

We believe a Smith machine produces a better chick than can be produced with any other type of equipment, and produces it at a lower cost per chick.

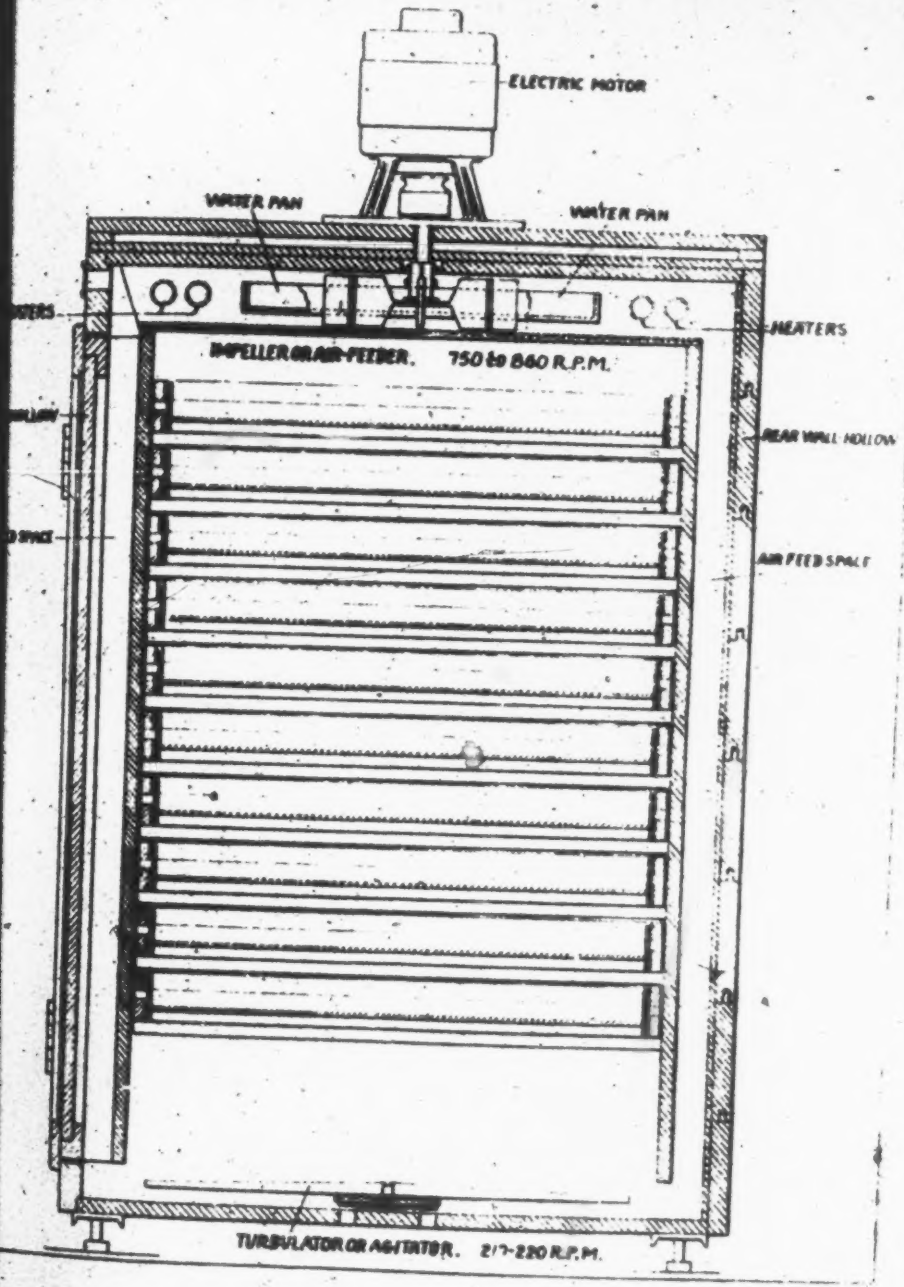
1391

DEFENDANT'S EXHIBIT No. 18 A



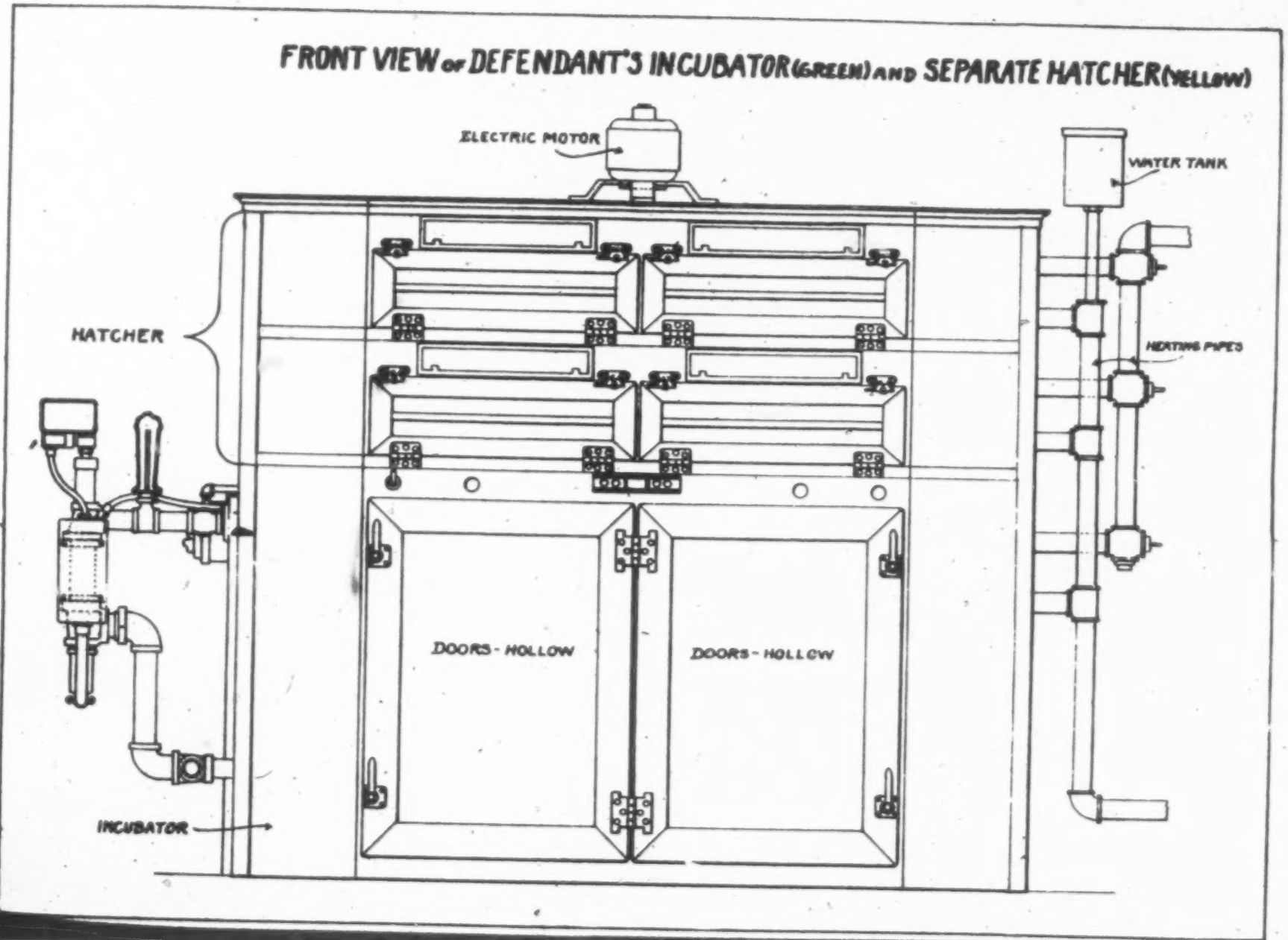
DEFENDANT'S EXHIBIT No. 18 B

VERTICAL CROSS-SECTION OF DEFENDANT'S INCUBATOR.

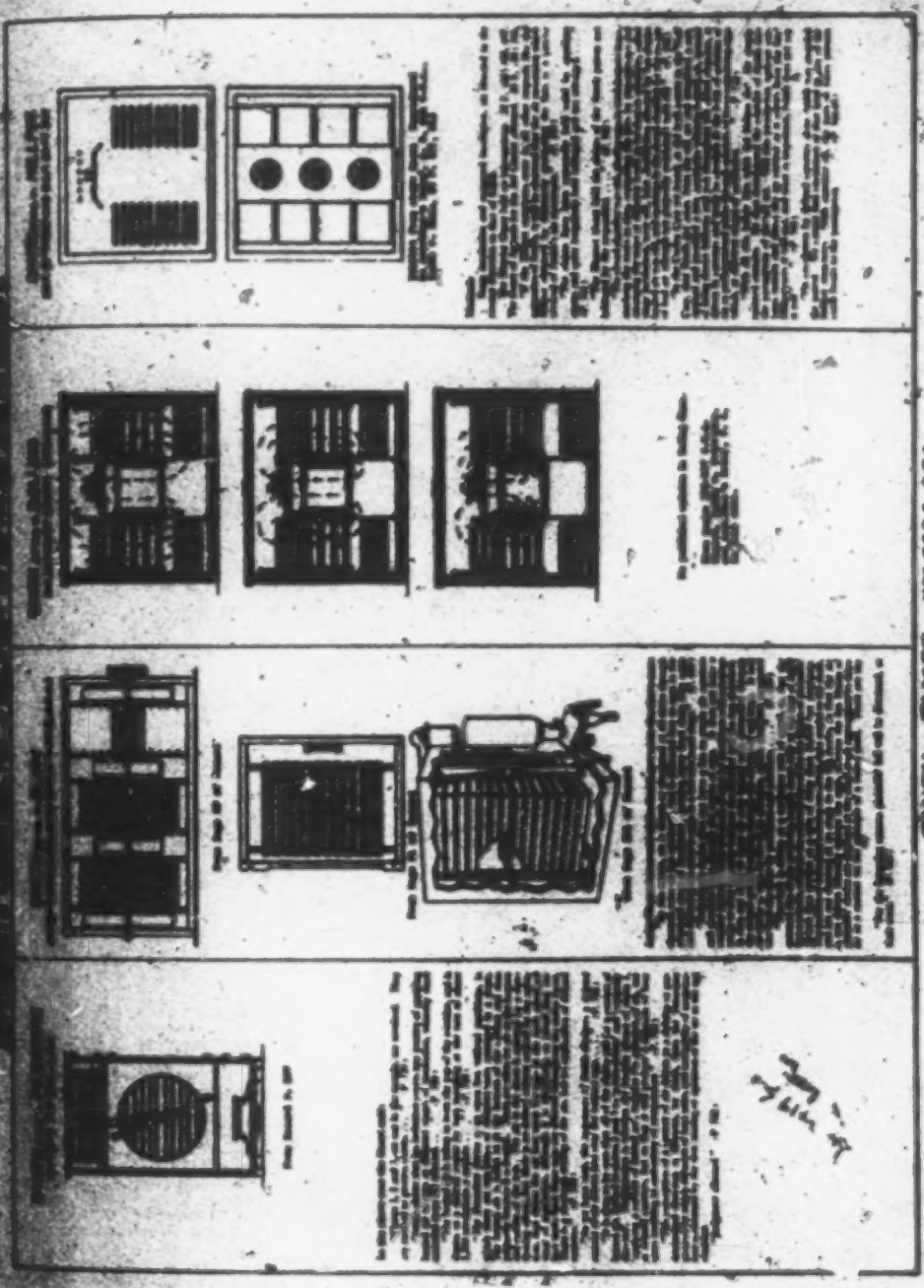


1394

DEFENDANT S' EXHIBIT No. 18 C



DEFENDANT 8' EXHIBIT No. 18

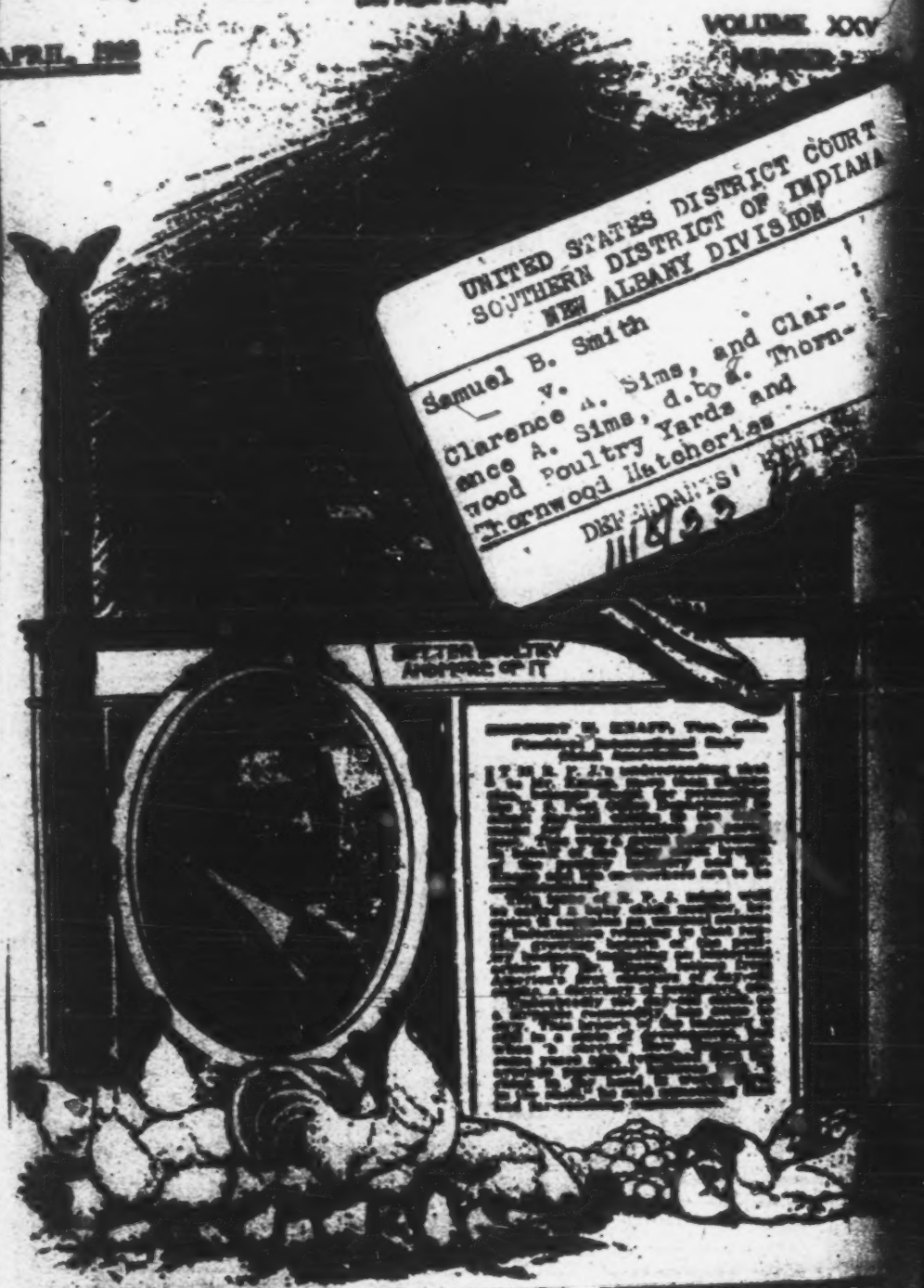


1106

DEFENDANT'S EXHIBIT No. 20

Boy-Old Chicks Admitted to United States Parcel Post

APRIL, 1918 VOLUME XXV



NINETY CENTS A YEAR
U. S. Food Administration

1398

Hastings Mechanical Draft Chick Hatchery

"Hen Incubator" History of Its Development, As Told By Editor of New York Daily Journal Wanted to Know Where Eggs Were to Be Obtained—Northern Ohio Is Now Relied On For the Supply—Some Business!

By Alfred HASTINGS, Tiffin, Ohio.

[illegible] the temperature evenly throughout the storage room.

This practical demonstration of my former conception in an effort to establish me to develop more fully my idea of mechanical draft incubation. I completed from the experiment carried with this in view and published in the spring of 1905 a book called "The Hastings Hen" in which I made a lengthy prophecy of the development of this then unthought of and almost laughed at idea. Some of my prophecies would be fulfilled, which I have accepted by all chemical [illegible] and [illegible] that [illegible] have of my theory would be fully [illegible] which I [illegible] have accepted by all chemical [illegible] and [illegible] that [illegible]

EGGS [illegible] per 15 $2.0 per 30 [illegible] per 100 [illegible]

HARRAWAY'S BARRED ROCKS [illegible]

WAR PRICES! [illegible]

Halbach's White Plymouth Rocks
EGGS AND BABY CHICKS
CATALOG 10 CENTS MATING LIST FREE
H. W. HALBACH & SONS Box 6 WATERFORD, WIS.

When Others Fail, Try Hoekzeker's Reds
Wonderful quality. Scoop in shape, deep, even, excellent markings and type. Prices right.
T. L. HOEKZEKER, Red Specialist, R. R. 5, ROSEDALE, KANS.

Greenan's Imperial White Wyandottes
[illegible]
JOHN D. GREENAN [illegible]

Special Sixty Day Offer
Express Prepaid

[illegible]
HARRYHOURS POULTRY FARM, Inc.
Dept. B Dunkirk, New York

18 POULTRY RECORDS

THE PILOT RECORD.

Preserve Your Eggs Now; 30 Dozen for 40 Cents

NOBILITY WHITE ROCK

PALMER'S BARRED ROCKS

Tolman Fresh Air Strain White

Day-Old Chicks and Eggs for Hatching.

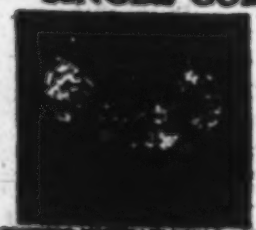
that live and give results.

WRITE FOR PRICES

JOSEPH TOLMAN

R. F. D. 1, Dept. 1.

SINGLE COMB WHITE LEG



HOUSTONIA CHAMP

Red Sussex

Whiners at America's Greatest Exhibitions,

Leaders at America's Egg Laying Contests.

BOOK YOUR ORDER AT ONCE

HOUSTONIA POULTRY FARM Dept. H

No. 2 is unusual for a duck to lay eggs that in the fall and first part of winter. In the natural breeding season grind ducks will lay practically an egg every a day, and until the last twenty or twenty-five years they almost never laid in the fall or early winter. In recent years well-fed ducks would begin to lay late in the fall, and some duck growers have hatched ducklings from these very early eggs.

Smith Standard BABY CHICKS

America must grow more poultry this year. We will help by producing nearly

2,000,000 Chicks in 1918

Incubator Holds Forty Tons of Eggs

SMITH STANDARD CO., [illegible] Cincinnati, Ohio

WRITE QUICK

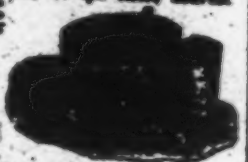
For the BLUE HEN FREE BOOK and OFFER!

BLUE HEN COLONY BROODERS

BLUE HEN LAMP INCUBATORS

BLUE HEN HOVERS

WRITE FOR FREE BOOK AND OFFER



WATSON MFG. CO.

1400

DEFENDANT 8' EXHIBIT No. 21

DAVIS HATCHERY OF BROOKLYN, N.Y.

FIG. 1.

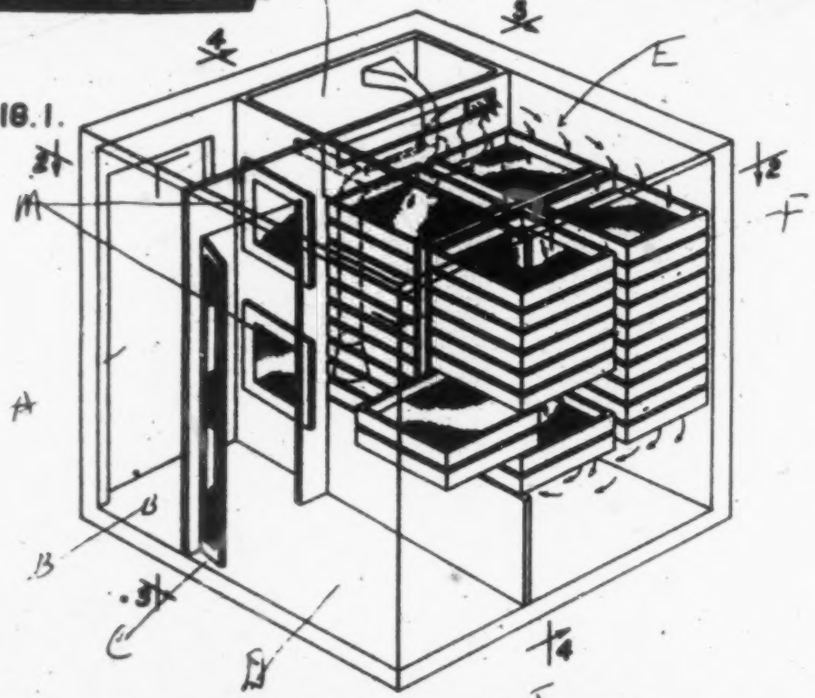


FIG. 2.

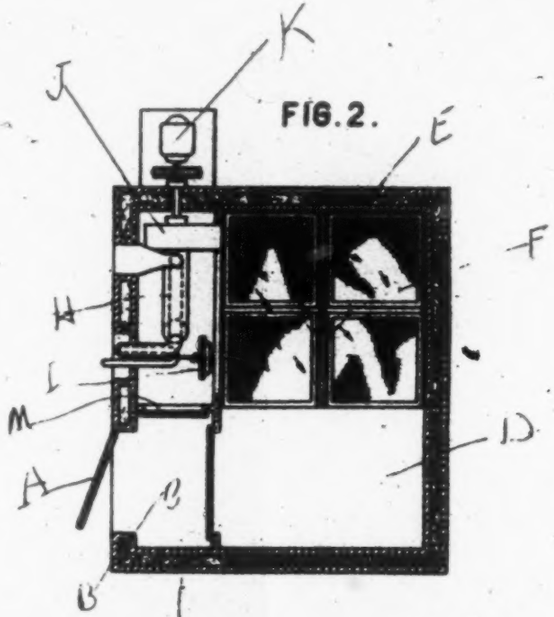


FIG. 3.

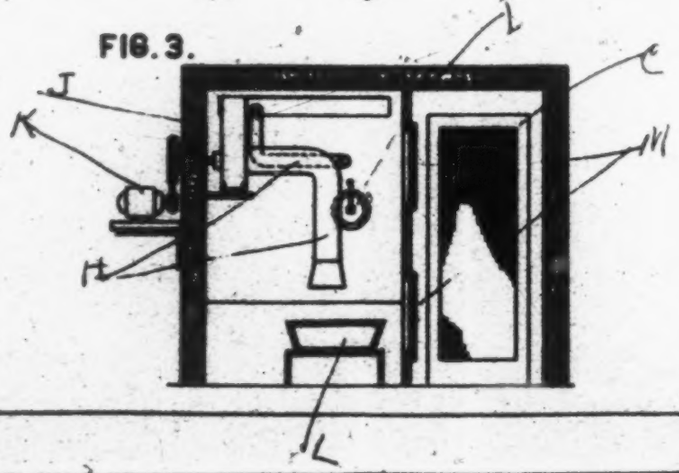
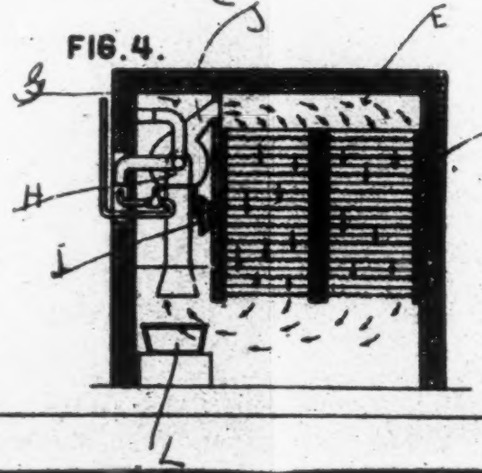


FIG. 4.



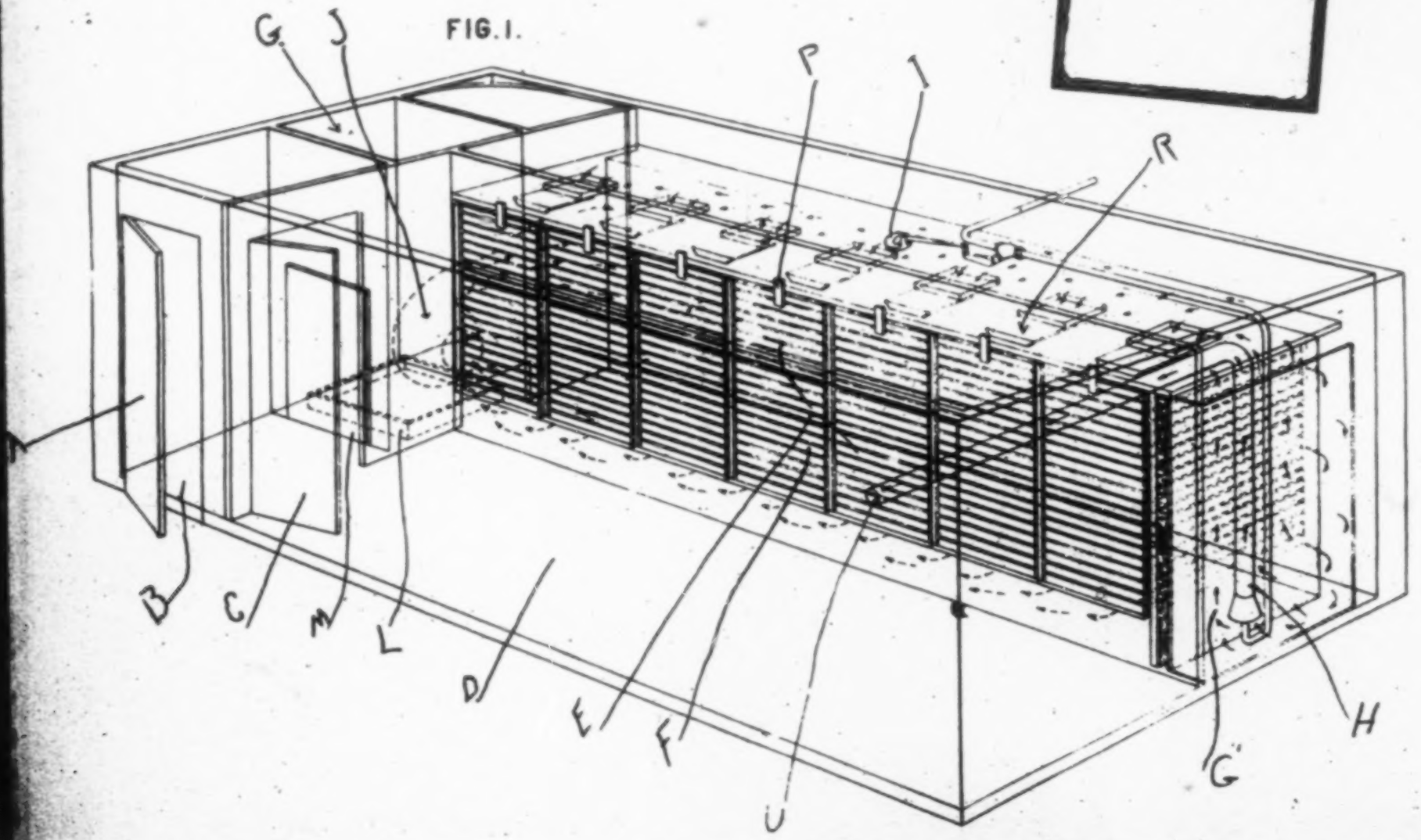
1401

DEFENDANT'S EXHIBIT No. 22

HASTING'S MUSKOGEE HATCHERY
1911-12

Ditto Exhibit 22

FIG. 1.



1402
DEFENDANT'S EXHIBIT No. 22 A

HASTING'S MUSKOGEE HATCHERY
1911-12

FIG. 5.

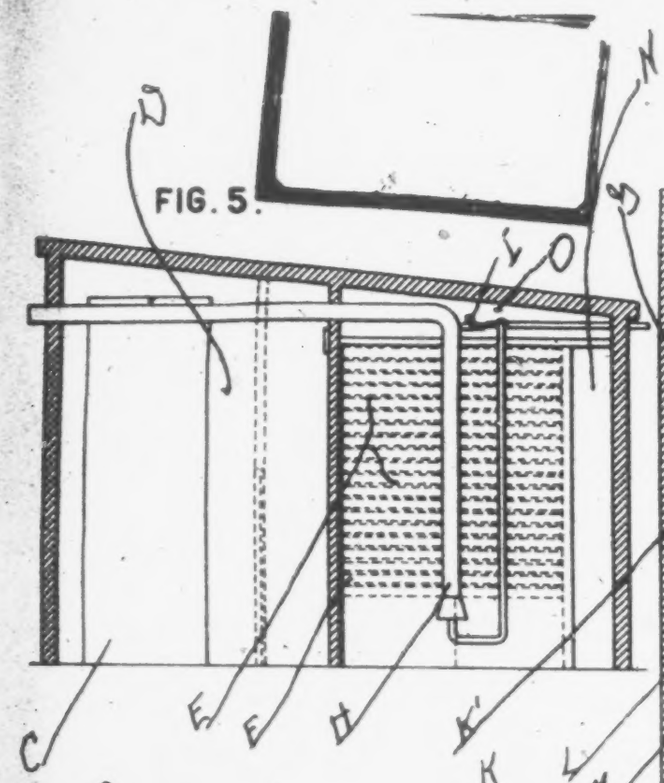


FIG. 2.

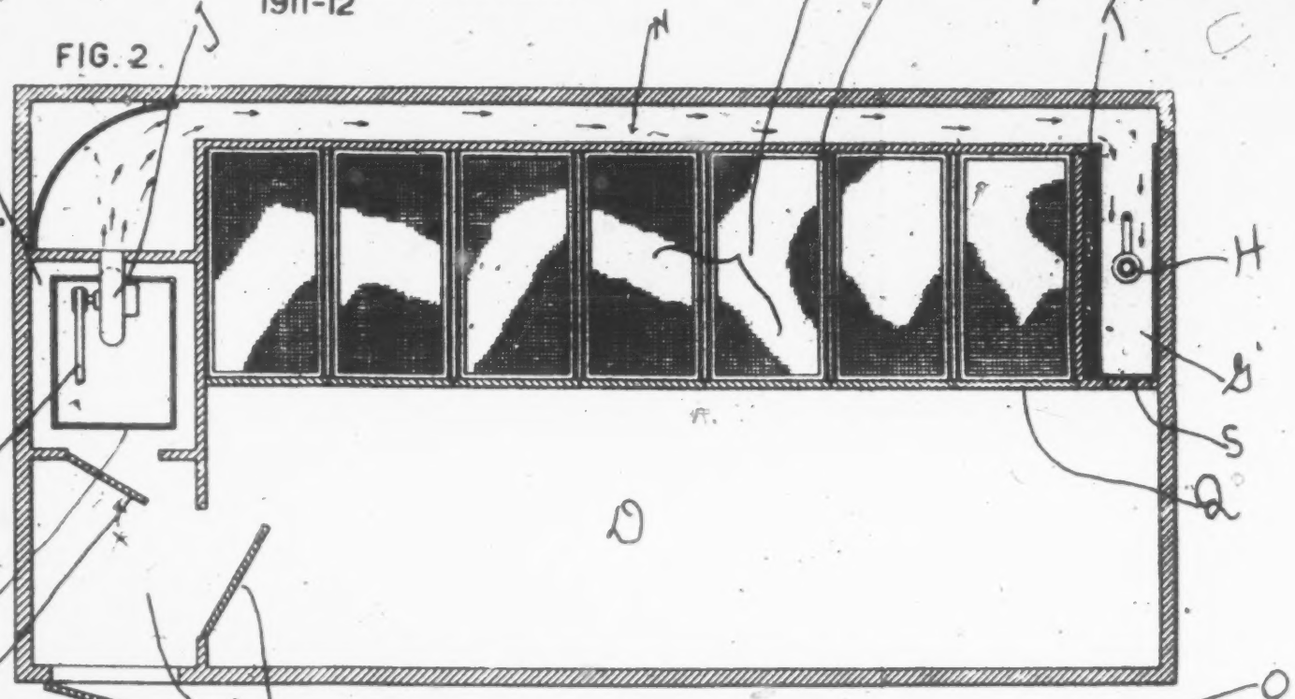


FIG. 3.

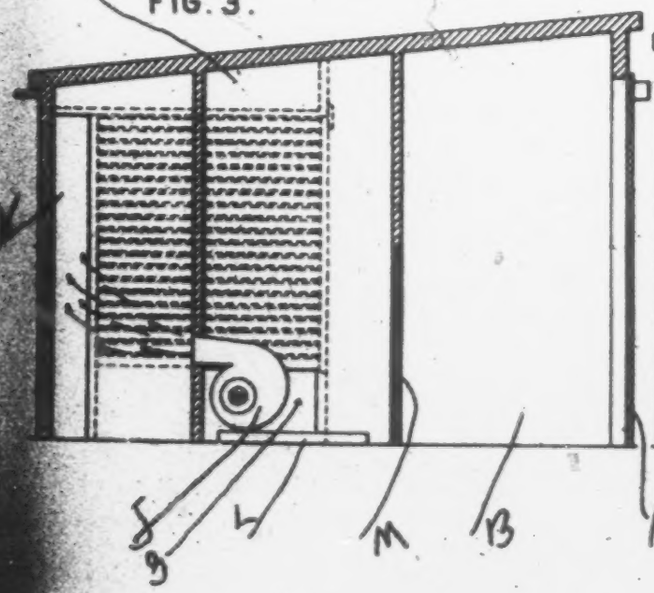
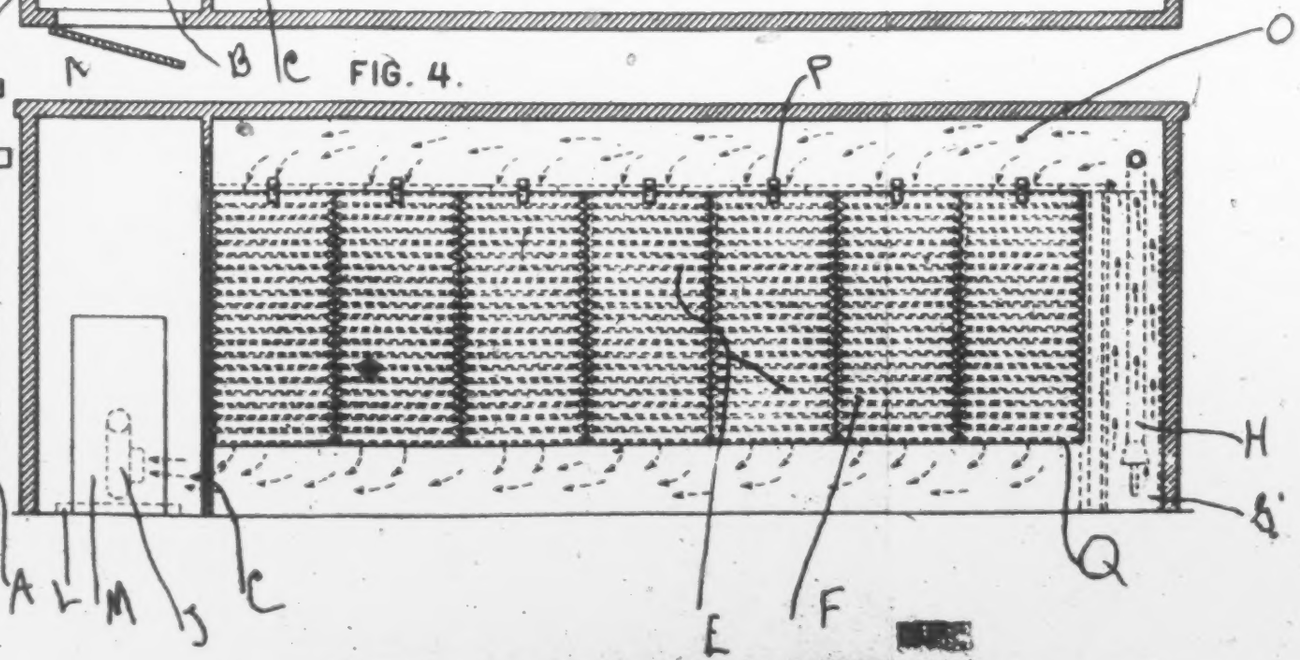


FIG. 4.



DEFENDANT S' EXHIBIT No. 22 B

DEFENDANT S' EXHIBIT No. 22 C

DEFENDANT S' EXHIBIT No. 22 D

DEFENDANT S' EXHIBIT No. 22 E

DEFENDANT S' EXHIBIT No. 22 F

THE MAMMOTH INCUBATOR OUT-MAMMOTHED

HOW MILO HASTINGS, A KANSAS PRODUCT, IS STARTLING THE WORLD WITH HIS BIG CHICK FACTORY.

By Ralph H. Smith, Associate Editor.

[illegible] incubator [illegible] and poultry [illegible] are [illegible] [illegible] [illegible]

One of the most unpractical Rube stunts shown during the past season.

the pressure is reduced by successive float governors and is burned at about one-tenth the street pressure. This gives ample heating in time of trouble. The quantity of heat is controlled by three thermostats. One is in operation all the time, giving the constant regulation necessary. A second comes into play should the temperature in the air flumes become more than one degree below normal and a fire device shuts off the gas entirely except the night flames, when the temperature goes one degree too high—an alarm bell also rings to call the attention of the attendant if the condition is large.

An attendant is on the premises twenty-four hours a day at the present time, sleeping in an adjoining room at night. As soon as the business warrants it a shift of men will be employed so that some one is at work in and about the hatchery at all hours.

As precaution against a break in the gas main company the company has on hands suitable blue flame kerosene burners to keep up the temperature, should the gas get out of order, a duplicate is ready to be lighted in its place. A shut-down in the power house would be as serious a mishap as could occur, but that too is provided against by having so arranged that the entire contents of the hatchery could be kept at incubating temperature by keeping a man on the job, frequently exchanging top and bottom trays.

All these things sound complicated, but are merely precautionary measures taken to insure thoroughbred eggs. In daily practice the hatchery runs along quite automatically, continually adjusting itself to the changing demands upon its limit-

My Incubator Is Wonderful! Just Takes One Gallon of Oil to a Hatch

J. H. KATE
President

AND there are a hundred other reasons why it is *entirely different* and remarkably *better in principle* —miles ahead of *every one of the old style machines* on the market. First—because I put the lamp on my X-Ray incubator underneath, square in the center, where it belongs—and not on the side. Then there's no cold side—but there *is* an even, regular temperature of heat all over the egg-chamber *all the time*—such a perfect hatching temperature that I can *guarantee* you bigger and better hatches every time! In placing my lamp underneath I gain a mighty big point. I make it possible to use a *big* oil tank—one that holds from 4 to 5 quarts of oil—but just 4 quarts are needed for a hatch—that's another thing I can *guarantee*. My perfected automatic trip—an exclusive X-Ray feature—accounts for this great saving of oil! It cuts down the flame *at the burner* when the egg-chamber gets too hot—so there's no excess heat escaping all the time and eating up your fuel—causing smoke and smell as with other machines—no waste of money in my—

X-RAY INCUBATOR

"Built Different from all Others"

the *best hatching* one on the market. The absolutely different kind of my machine is unquestionably just as important a feature as my perfect heating system. The lid has *two* double-glass panels and you simply take it to ventilate or turn the eggs. Eggs are never taken out of my X-Ray incubator—remember that! You can *see* the thermometer *any minute at a glance without raising the lid*—and testing cold air in—look right through the glass.

Requires Only One Filling of the Lamp

Instead of wasting heat—it *saves* it. The X-Ray uses only one gallon of oil—others waste have 3 to 5 gallons and they have to fill their lamps *every single day*. To use my X-Ray incubator means less handling of eggs, far less oil expense, less heat generated, absolutely no waste whatever of heat or oil. No filling of lamps during the hatch. No burner—longer of "cooking" eggs—always an even temperature in the egg-chamber. Eggs need not be removed during entire hatch. [illegible] the most wonderful hatch in the world—[illegible] It's the most wonderful hatch in the world—it's the only hatch ever discovered that can be operated from start to finish *entirely without moisture*—through ordinary dried air.

The Only Improved Incubator and Brooder—Get Free Book!

If you are going to get an incubator or brooder, or both, why not get the most improved, most up-to-date machine that is made? Why not get one that's built on the principle that you want to use in your home—not one that's built to sell? You want one that's simple to operate, that's sure to hatch every fertile egg you put in it, that's safe, that's economical. Why not get the

DEFENDANT S' EXHIBIT No. 24

Popular Mechanics Magazine

318 W. Washington Street, Chicago, U. S. A.

EDITED BY H. H. WINDSOR

ISSUED MONTHLY

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Popular Mechanics offers no premiums; does not join in "clubbing offers," and employs no solicitors to secure subscriptions. It is for sale by nearly every newsdealer in the United States and Canada.

THE ELECTRICAL CULTURE OF CHICKS

One of the most interesting features of a 30,000-egg electrical hatchery at Muskogee, Oklahoma, is the method of forcing the growth of chicks by the aid of electric light. A 60-watt tungsten lamp, which, by means of a special switch, is turned on and off for alternate periods of eight hours each, is suspended in the runway. The chick fills its craw in the eight hours of electric illumination, and rests during the eight hours the light is shut off. Thus, the chicks live three electric days in two ordinary sunshine days. In the customary way of brooding chicks, eight hours out of the 24 are wasted, or to express it electrically the load factor is 66 per cent. The electric outfit, however, is run at nearly 100-per-cent load factor, and electric chicks four weeks old far outweigh chicks brooded in the old way.

The fluffy kilowatt-ampere chicks never see the light of day if they are only destined to reach the stage of development known as "squab broilers." They are electric squabs pure and simple, and their lives have been strictly ordered by a time switch and a tungsten lamp. They would hardly know the good old-fashioned hen mother if they saw her. They would not, in all probability, respond to her agitated clucks, for their life schedule has been to eat eight hours, rest eight hours, then eat again for eight hours, and thus gain eight hours on Mother Nature.

The hatchery is a low brick building about 20 ft. square, and the large capacity of

Chicks just Hatched in Electric Incubator, on the Way to Electric Brooder

the incubator is attained by placing 30 trays one above the other, so that 1,800 eggs fill a single chamber about 3 by 4 by 4 ft. in dimensions. This arrangement of the trays is made possible by the use of an electrical fan, which drives a blast of warm air through the mass of eggs from top to bottom, and heats or cools the mass at the will of the operator. A duplicate fan is kept always at hand, for a sudden stop in the movement of warm air among the trays would result in all the eggs having to be thrown away. Reliability of current is, therefore, a big feature of the success.

THE NECESSITY FOR SPEED-BOAT COSTUMES

Racing automobilists and airmen are adequately provided with costumes fitting the requirements of each, but, as yet, the driver or pilot of the racing motorboat has not been given special attention in this matter. That the hydroplane driver is very much in need of an adequate costume, however, is clearly shown in the accompanying illustration. Seated on the stern of the "Al Thomas, Jr.," a speed boat of the east, is one of its pilots. He is wearing a pair of socks, a bathing suit, a life preserver and a pair of automobile goggles.

WHERE THE WORLD BEGINS

The beginning of the world, all pessimists to the contrary, is the center of a door of the Royal Observatory at Greenwich, Eng. The transit circle which marks the zero-meridian passes directly through the center of this door

The Center of the Door is the Beginning of the World

which is the middle one, and is opened when an observation is being made. The center of the door is thus 0 deg. longitude—the beginning of the world.

FIREMEN AS WALKING FOUNTAINS

A German inventor proposes turning the firemen of Berlin into walking fountains in the manner shown in the illustration. He claims that the water-spraying device worn on the head, and fed by a second hose, makes it safe for firemen so equipped to approach much closer to the flames than under ordinary conditions. He calls the idea a "wet uniform."

The "Wet Uniform": A Fireman Converted into a Walking Fountain

ELECTRICITY IN THE WORLD'S LARGEST INCUBATOR.

Muskogee, Okla., has a 350,000-egg incubator, the heat control and air circulation for which are effected by electrical means, while the growth of the chicks is artificially forced by tungsten electric light. Use of motor-driven blowers to circulate the air heated by natural-gas burners has made possible the compact construction of this hatchery, the egg trays of which are superimposed on racks twenty deep. Five thousand eggs can thus be handled and hatched in a space 3 ft. by 4 ft. by 4 ft., requiring only about one-tenth of the volume demanded by the old-style incubators. After hatching has begun trays with high sides are substituted for the incubating trays, each high-side tray occupying the space of two of the ordinary trays.

Although the idea of converting the whole building into a hatchery, with superimposed open trays for the eggs, is said to be new, according to Mr. Norman B. Hickox, contract agent for the Muskogee Gas & Electric Company, the use of a motor-driven blower at Muskogee to force the evenly heated air to all parts of the tray racks has for the first time made this method practicable on a large scale. Humidifying of the air is controlled by passing it over open pans of water, as shown in Fig. 2. A home-made thermostat controls the natural-gas supply to the burners through a mercurial valve, keeping the temperature in the incubator constant at 100 deg.

In the runways electric light has been used to force the growth of the chicks with surprising success, says Mr. Hickox, the scheme being to substitute sixteen-hour artificial days—with eight-hour light and eight-hour dark periods—for the natural twenty-four-hour cycle. As explained by Mr. Hickox, the chick of this forcing is quite rational. The chick naturally eats during hours of light, and his craw digests the food after dark. In eight hours he can eat all the food needed, and in another eight hours

Fig. 1—Mr. Norman Young With

a grown his little crew will have fully equipped to venture. "It follows," as quoth Mr. Hickox, "that under the ordinary way of brooding the chick is fed eight hours out of the twenty-four, or, to express it diagrammatically, his feeding-factor is only 33 per cent. Mr. Hendrix, the owner and inventor of the hatchery, thus runs his chicks at nearly 100 per cent load-factor. In this way live three electric days during sunshine days, and the four-week-old

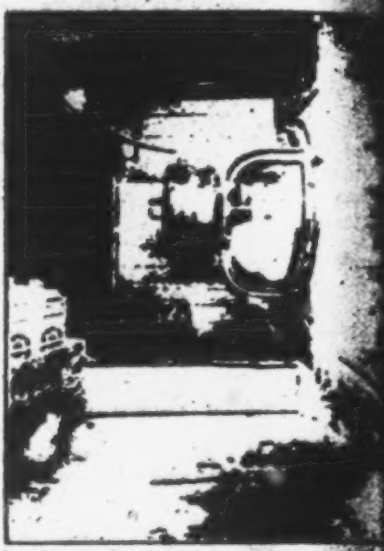

Fig. 2—Motor-Driven Blower for Heated Air

chicken will far outweigh his normal brother 66 per cent load-factor fashion."

MINE GENERATING PLANT AT MOGOLLON

An interesting generating plant has recently placed at Magdalen, N. M., for the Socorro fully equipped for furnishing both electric and air mine service, with all engines as prime The plant housing consists of very simple construction one-story, wood-frame, iron-sheathed building plan 60 ft. by 80 ft. over all and open interior. The equipment consists of one 250-hp twin oil engine a 150-kw, 500-volt alternating-current generator hp twin oil engine belted to a 100-kw, 500-volt current generator, and one 250-hp twin oil engine countershaft which in turn drives two 50-hp air compressor and one 75-kw, 120-volt direct-current. An auxiliary drive for the compressors is obtained by a belted 150-hp, 500-volt induction making it possible to keep the second 250-hp in reserve.

The engines operate on crude oil, of a gravity of 25 deg. Baumé, fed through a 3-in. supply line from gas-oil, which buried underground 100 ft. from the engine. An auxiliary gasoline tank, with pump, is provided to the main supply line to each engine, for use in starting in case none of the tanks is operating. For starting conditions an engine unit receives its power by using the belted motor as a motor, which picks up under its own power. The transformer supply for the motor is taken from the 120-volt mine supply. This plant forms a self-contained unit for mine operation, furnishing current and alternating-current supply and lighting, motor and compressed air service.

[fol. 1411] DEFENDANTS' EXHIBIT No. 26

(This item is the Hickox Album called for as a physical exhibit but Exhibits 26-A, 26-B, 26-C, 26-D, 26-E, 26-F, and 26-G, are excerpts from that album.)

DEFENDANTS' EXHIBIT No. 26-A

Visitors of the Oklahoma State Poultry show for 1911, when in Muskogee, had an opportunity to visit Muskogee's 30,000 egg incubator. The hatchery is itself a building, and the attendants and visitors do not look into the incubator—they enter it. It is a low, brick building about twenty feet square, such as could conveniently house about eight of the largest size old-style incubators, which would give a capacity for hatching about 3,000 eggs.

Under this roof can be hatched 60,000 eggs at one time, although accommodations for 30,000 are now all that are needed. The full 60,000 capacity can be ready for work, however, upon a few days' notice. The large capacity is attained by superimposing twenty trays, one above the other, so that 5000 eggs fill a single chamber measuring about 2 by 4 by 4 feet. Figures 5 and 7 show how these chambers are constructed and how the trays are set in.

When the hatching begins, alternate trays are fitted with high sides which will require two compartments for the actual hatching out of the twenty trays incubated in one compartment. Figure 4 shows the attendant removing the hatched chicks from one of the hatching trays.

The big idea in the hatching business is to get cheap chicks; and space economy, such as this mammoth incubator gives, along with the low cost of equipment, will tend [fol. 1412] to not only produce cheap chicks, but more chicks, and stronger ones.

It is a very simple idea, that of placing the trays one above the other, and like all other simple ideas it has been tried before, but failed to work on account of the fact that it was hard to heat up such a large mass of eggs and maintain the temperature constant at all points. This was overcome, however, by the use of an electrical centrifugal fan, which drives a blast of warm air through the mass of eggs

from top of bottom and heats the entire mass of eggs (or cools it) at the will of the operator. The amount of moisture in the air is governed by the moisture introduced at the fan, as is shown in Figure 2.

Upon entering the hatchery we are first taken into a small ante room, as shown in Figure 1. The natural gas line which furnishes the gas for heat is shown on the wall and passes through a mercurial float valve, which is automatically controlled by the thermostat of home-made construction. This thermostat is set to operate at a desired temperature so as to close off the gas when the room becomes too hot. There are two other such arrangements on the same line, one of which is shown on figure 6. These are merely to check each other, so as to insure the gas being shut off when the temperature rises, and make a positive prevention against ruining many valuable eggs. The man in the picture is Mr. Hastings, inventor and builder of the hatchery. This is the process of testing the eggs for fertility.

The ante room contains a compartment, shown in figure 2, in which is placed the ventilating fan, the life of the in- [fol. 1413] cubator. Outside air can be admitted to this compartment whenever necessary. This also shows the pan of water underneath the fan, to keep the moisture in the air at the right amount. This fan is supplied by central station service, and the owner of the incubator keeps a duplicate on hand at all times to immediately put in place should a break-down occur. As a stoppage of ventilation would make it necessary to throw away all the eggs in the incubator and start over again, it will be seen that the dependability of the central station service is the biggest point of the whole process.

From here we enter the main incubator, in which the temperature is always kept at 100 degrees. The attendant will be seen in figure 3 pulling out trays of eggs for turning, which is done three times a day by hand. In this runway the first experiments in forcing chicks by aid of the tungsten lamp were carried on. By a special time switch light was furnished the baby chicks for eight hours, a 60-watt tungsten lamp being used, and then their light was shut off for eight hours.

It has often been said that nature is not everywhere perfect, and in this case it is found possible for the baby

chicks to live three electric days in two ordinary sunshine days, as the chick can fill its craw very easily in the eight hours of light, so its digestive organs perform their functions in less time than eight hours. Under the ordinary way of brooding chicks it can thus be seen that there is eight hours out of the twenty-four that the chick is idle, or to express it electrically, the load factor is 66%. We are always striving for business at a high load factor, so [fol. 1414] you can readily see that our friend Hasting runs his chicks at nearly 100% load factor, thus resulting in an efficiency so increased that the electric chick four weeks old by far out-weighs his (or her) brother or sister brooded in the old way at 66% load factor. The following article taken verbatim from the columns of the Muskogee-Times-Democrat of February 26 contains a true story of some of the strange actions of the four-weeks old electric chick, when he (or she) first sees the light of day:

Electric Light Chickens

"Miss Kilowatt Ampere Whiteleghorn has made her, or his, according to the point of view as they all look alike in the first stages, anyhow, appearance in Muskogee.

Miss Whiteleghorn is a chicken and she is named from her, or his, mother, Mrs. Kilowatt Ampere. She, or he, was hatched under electric light in the new Hastings 30,000 egg hatchery on Third Street, just north of the Hinton Theatre.

He, or she, has hundreds of little brothers and sisters, and a few of them were sent out to citizens as samples of what a mother hen cannot do. They have reached the stage where they are known as squab broilers, not because they were born near the Hinton Theatre, but because they are a different breed from stage broilers.

They had never seen the light of day before being sent out, and to say that they were bewildered is putting it mildly. They are electric broilers pure and simple, and used to the Great White Way.

[fol. 1415] One citizen put him in the cellar where there was no electric light and where the light of day was the only thing in the way of radiance. The chick went around like a hen with its head cut off, and protested in all kinds of chicken talk as forcibly as a chicken can protest. As a result the owner of the house turned on the electric light.

The chick gave a series of delighted cheeps, tucked his, her, head under his, or her, wing and dropped off peaceful to sleep. Who says a chicken hasn't sense!"

To profit by the free advertising brought forth and keep it in the "psychological" stage the writer had accompanying cartoon drawn up, which was run in sp furnished free by the editor.

Figure 4 shows Mr. Hastings removing the hatch chicks from one of the hatching trays. Figure 5 show tray of eggs as they look when put into the hatche Figure 6 shows another of the thermostatic gas mercu float valves. The arrow in this picture points to the ho made thermostat which makes contact in a cup of mercu Figure 7 shows a tray of chicks just coming out, and top of picture can be seen the vents out of which come air driven by forced circulation. Mr. Hastings intends build a million egg hatchery and carry out his experime on a larger scale. His present ventures have all prov profitable, and there is no doubt that all of his future pla include the use of the convenient natural gas supply a also of central station electricity for power and the broo ing of chicks.

DEFENDANT S' EXHIBIT No. 25 B

1125

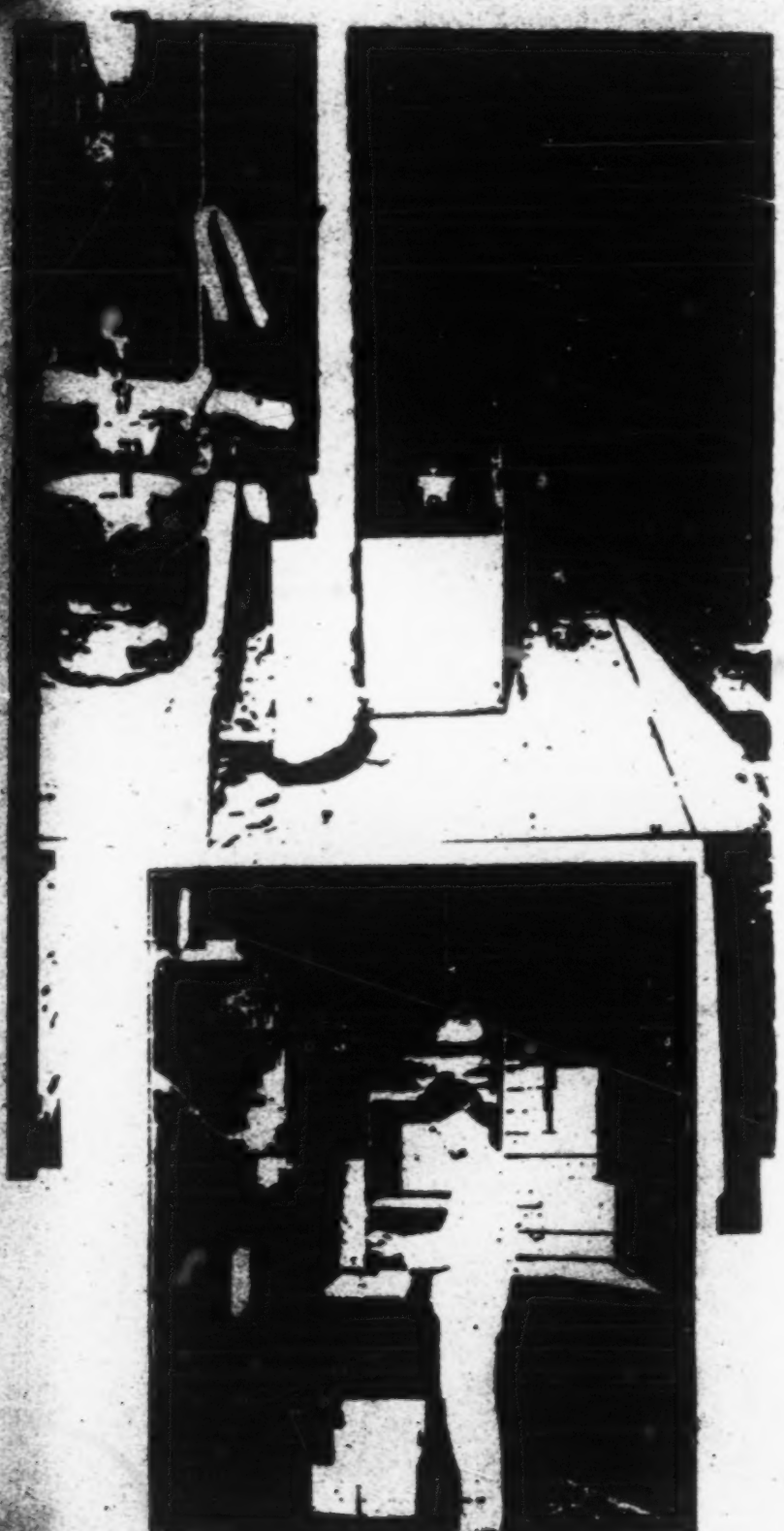

Fig. 1—Mr. Hastings Testing Spgn.

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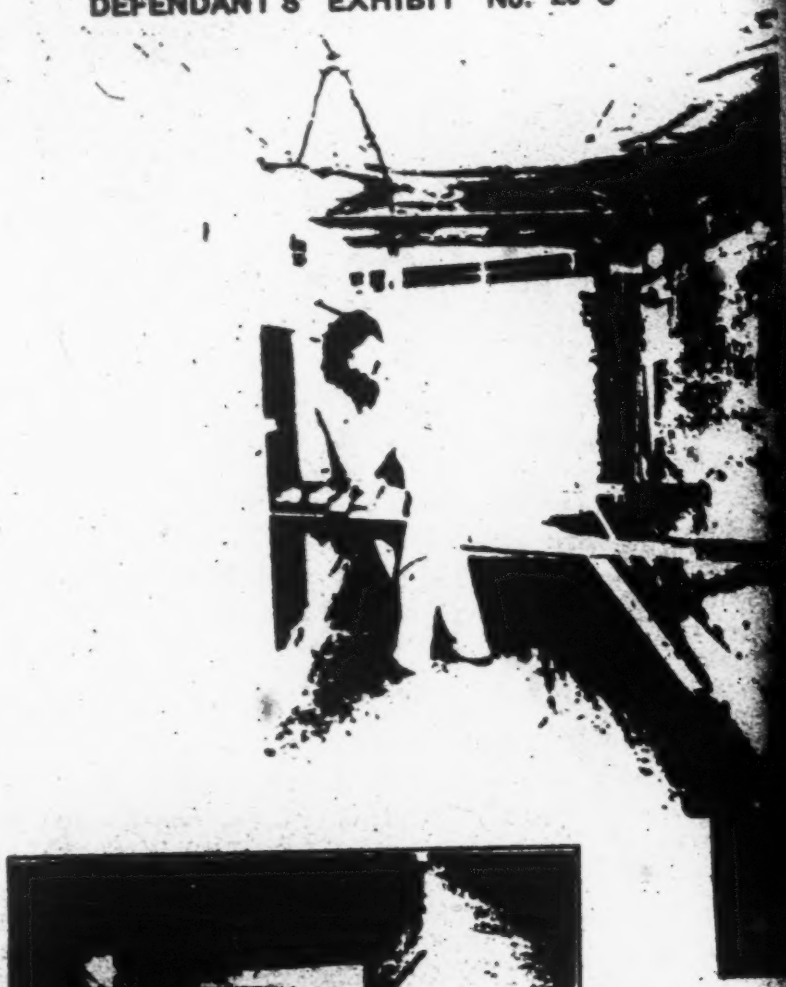
DEFENDANT S' EXHIBIT No. 26 C



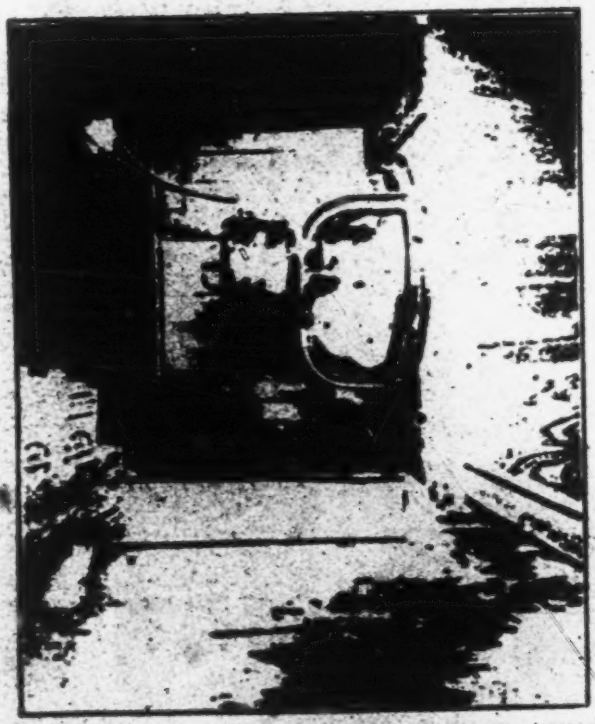
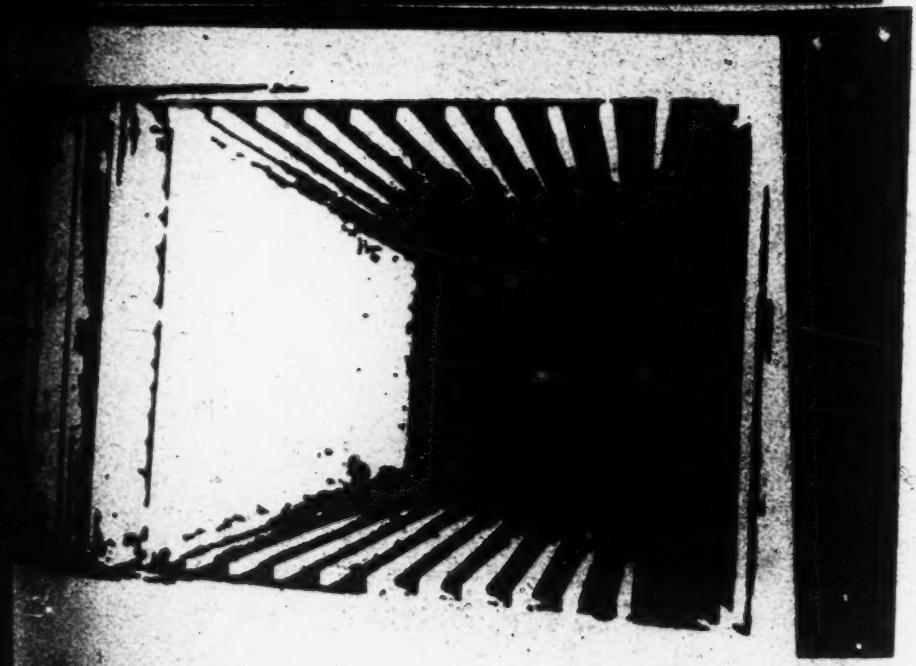


Fig. 3—Motor-Driven Blower for Heated-Air Circulating

DEFENDANT S' EXHIBIT No. 26 D



DEFENDANT S' EXHIBIT No. 26 E

Largest Chicken Hatche
In the World in Musk

In the heart of the city of Muskogee, and a stone's throw from the city jail, is located one of the most remarkable egg hatching institutions ever used in this country. Nothing else like it exists. In a little more, an hour than 40 million good sized house chicken eggs are daily going through the incubating process and thousands of downy covered and bespotted little feathers looking for all the world as though they had just stepped out from an Easter egg any busy scratching around with never an indicative thought of an old hen mother.

This wonderful invention is a child of the brain of Mike Hastings of Kansas, formerly a newspaper man in New York City. He thinks many of it like a big mother does of her twins. It is his desire to make Muskogee the great poultry hatching center of the country, and after traveling through thirty-seven states as a government expert for the department of agriculture, he has selected Muskogee as the ideal spot for the establishment of a million egg hatchery.

The idea is mammoth in point of numbers, but not mammoth in point of plan. Such an hatchery, built after said plans, would require a floor space of only 50 by 100 feet, and then there would be ample room for offices and shipping purposes. Both of concrete and steel with only a single floor level the expense would be nominal and the returns enormous. Within a radius of 50 miles of Muskogee hatched chicks can be shipped for less than one half cent per chick. In this territory there are great hustling for our broilers and roaster egg farms which would like an egg supply of one hundred million eggs and 5 per cent of that supply would keep the hatchery busy at all times.

The cost of hatching eggs under the Hastings plan is about one cent per egg. There are in this country two 120,000 egg hatcheries and a number of 100,000 hatcheries. Every one of them is profitable and they consist of large buildings in which are housed many small incubators. The cost of equipment is ten cents per egg capacity. For practicality the same cost on incubator with a million egg capacity can be constructed under the Hastings system. As an investment, even if the machine was not filled, the advantagement accruing therefrom would be worth the consideration of any city.

Established in Muskogee chicks could be shipped to Texas in January and February and to Kansas in May. The intervening months of April and March would supply this section for subsistence consumption. The field in which the machine could be supplied is unlimited. Kansas City, St. Louis, New Orleans, Dallas, Fort Worth, Houston, Joplin, Wichita, Topeka and many other sections.

The hatchery in itself is a building. Visitors do not look into it, they step right in and view the interesting process. The Muskogee plant is about 50 feet square and has a capacity of 1,000,000 eggs. This result is obtained by superimposing twenty trays, one above the other, in each compartment, the compartments being arranged about the wall, and each tray having a capacity of 500 eggs. The hatching compartments have a working capacity of 10,000 eggs per week.

The immense economy of space is alone sufficient to make the Hastings machine the wonder of the poultry world, but space economy is only one

DEFENDANT'S EXHIBIT No. 26 F

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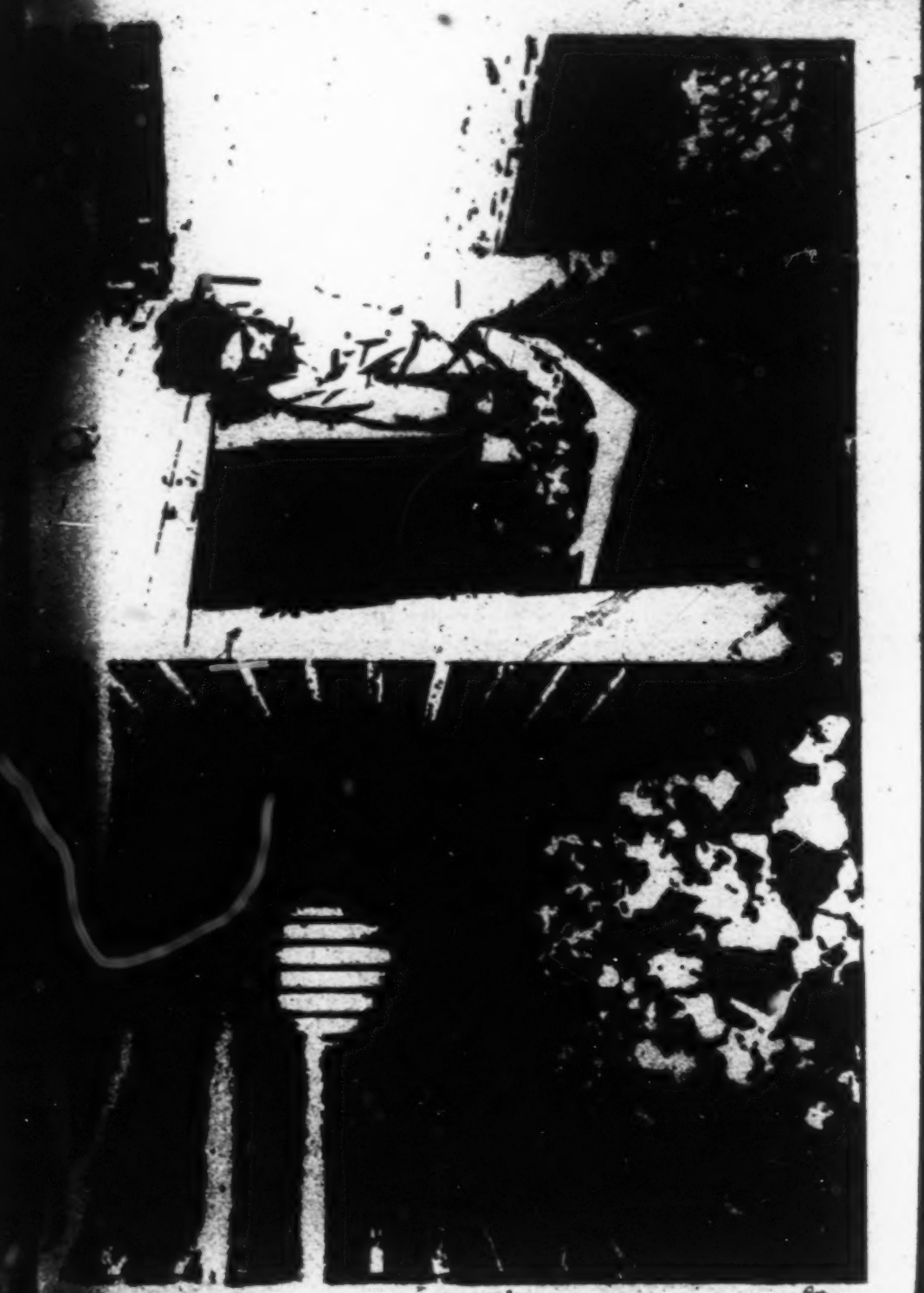

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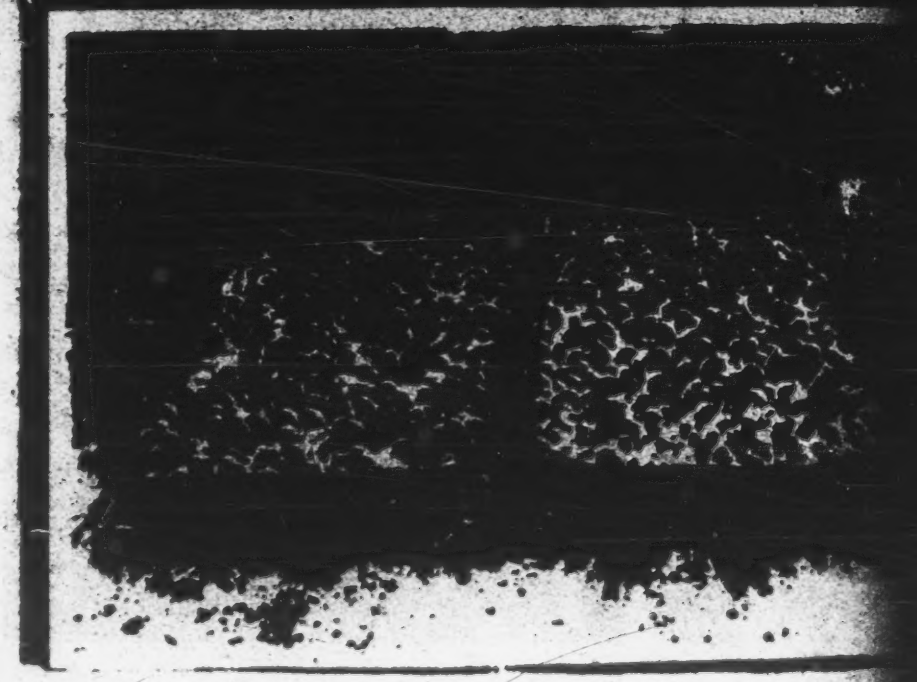

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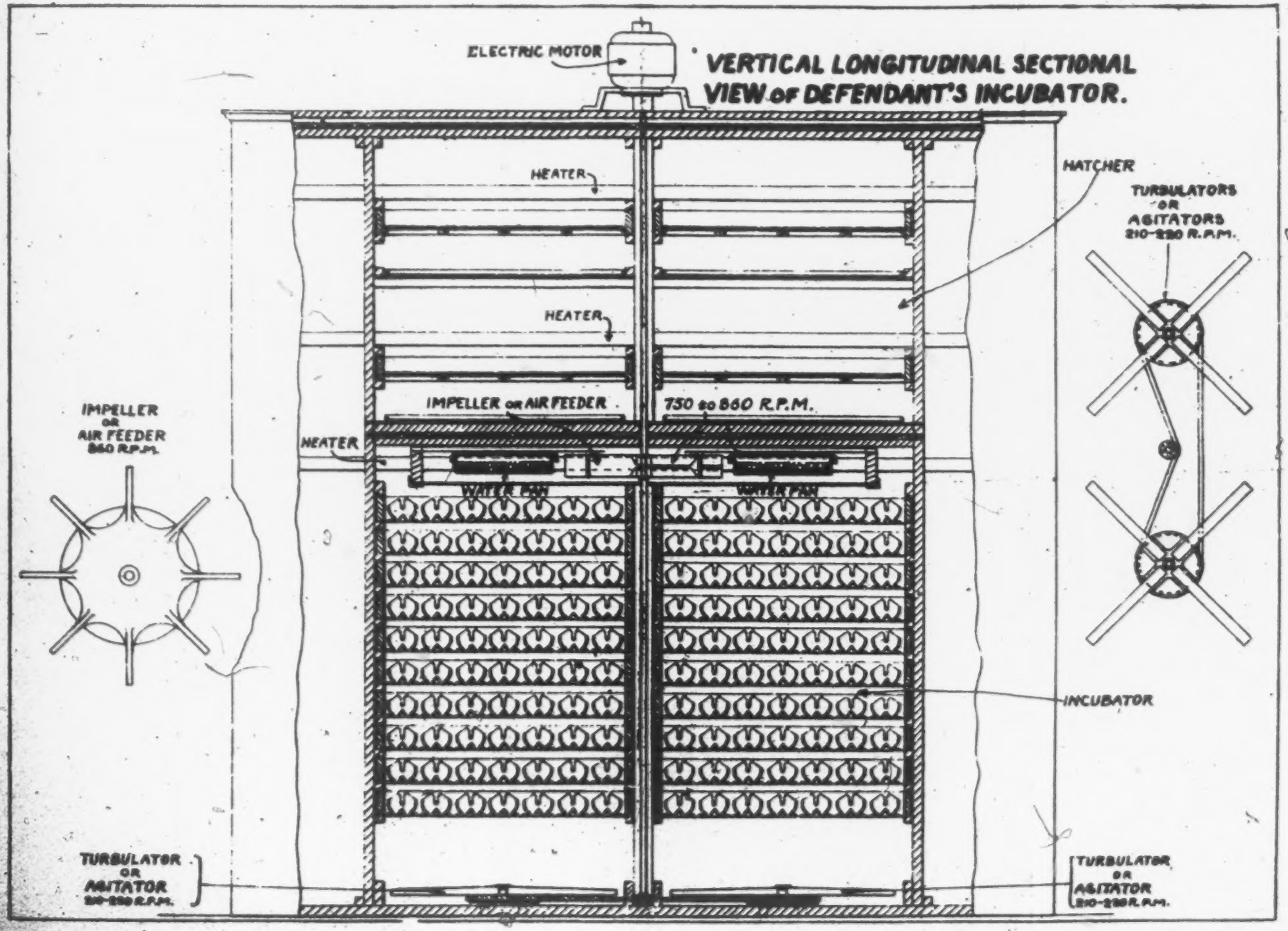
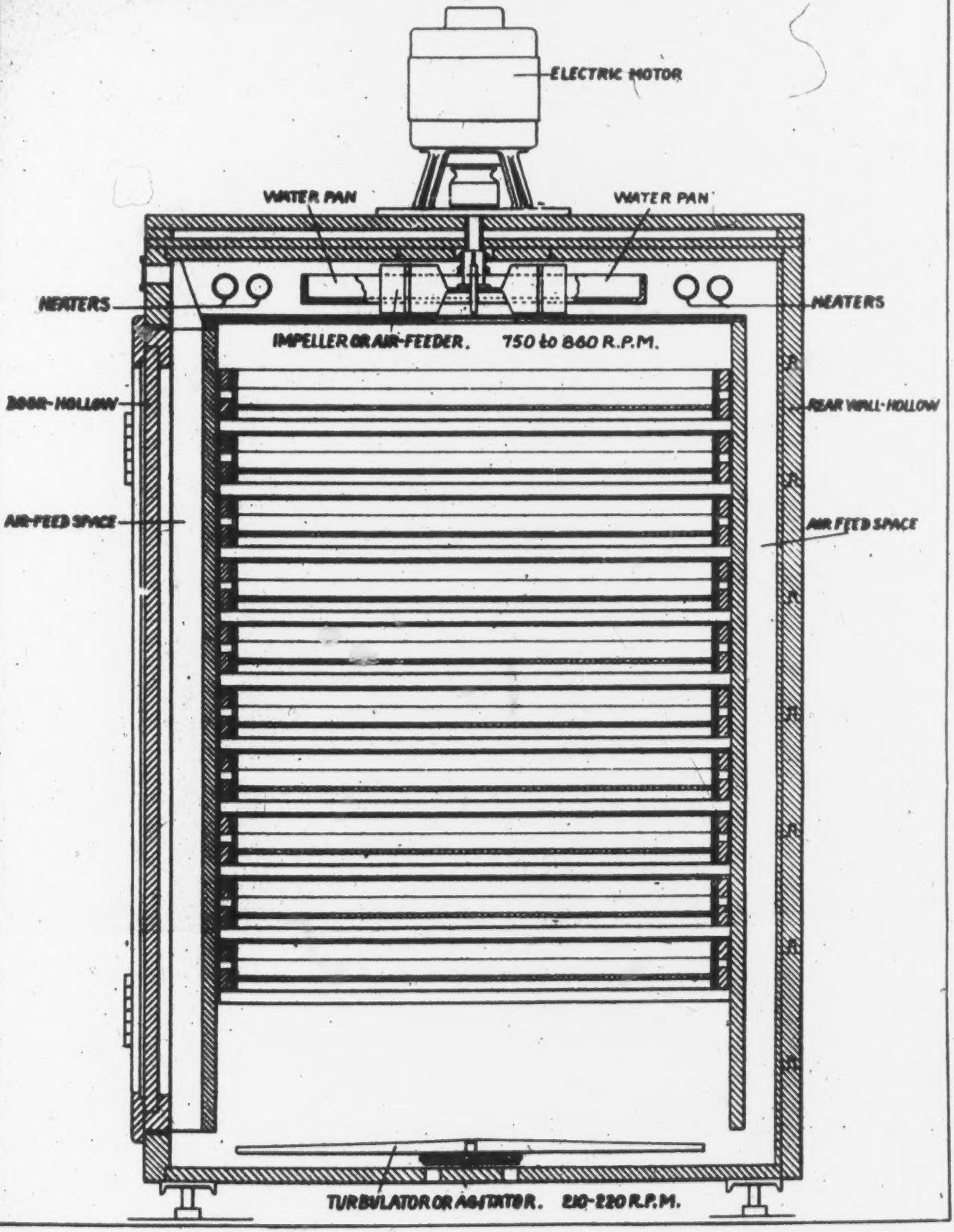
DEFENDANT 8' EXHIBIT No. 33

DEF. EXH. 33



VERTICAL CROSS-SECTION OF DEFENDANT'S INCUBATOR.



DEFENDANT'S EXHIBIT No. 34 1423

1132

Now is the time to Tighten Up

Never has it been so necessary to stop the leaks in business. Competition is keen. Prices are lower. Profit margins have been reduced. Most hatcheries are faced with this problem—to stay in business they must produce a better quality chick or produce them for less money. Undoubtedly, your hatchery has leaks. What can you do to stop them? Read on and see how up-to-date Smith Equipment will help you.

Tighten Up On Lost Customers

THE lost customer has assumed new and unusual importance in the hatchery business. There was a time when the hatcheryman did not need to worry about lost customers. There were more customers than chicks and when one customer disappeared, two sprang up to take his place. Times have changed. We see hatcherymen suffering because of lost patronage. Some hatcherymen who failed to conduct their business properly have disappeared entirely from the hatchery field. Today, we are in a competitive situation where a lost customer is a tragedy and where too many lost customers will lead to a business failure.

In the old days, when a large percentage of hatchery business came by mail, the lost customer was more easily replaced. Today, most successful hatcherymen depend largely on local trade for their success. Where your most profitable block of customers are to be found within driving range of your hatchery, the importance of maintaining the patronage and good will of these customers is of major importance.

If you sell chicks that are not properly hatched, death losses must follow and you will lose customers which cannot be readily replaced. Today, no hatcheryman is in position to gamble wrong ways. His product must hold the losses trade or he will be out of business. Many hatcherymen who have Smith Incubators alongside machines of other types frankly say that they reserve the Smith-Hatched chicks for their home trade. They realize the importance of satisfying their home customers and have learned that Smith-Hatched chicks are best for that purpose. *TIGHTEN UP—Smith Equipment Makes Satisfied Customers And Is The Cheapest Business Insurance Any Hatcheryman Can Buy.*

Tighten Up On Disease Spread

MOST successful hatcherymen are fumigating regularly and thus [illegible] disease spread. Remember that disease spreads in the [illegible] only as hatching eggs and from one chick to another. [illegible] spores are only released after the chick pips the shell. [illegible] a separate hatcher or in any other type of an incubator [illegible] the disease germs from being released from infected [illegible] chicks hatch. Proper fumigation will kill these germs [illegible] the chicks dried and before the germs can be carried to other [illegible] Disease germs are tiny, invisible spores which ride on dust [illegible] "drawn". The "drawn" itself, which is always present [illegible] are harmless in any household to the chicken. The [illegible] germs, are a problem in incubators with any infant type [illegible] of incubation. They can only infect chicks after they pip [illegible] chicks with just their separate hatcher or any type of an [illegible] and prevent the spread of disease by either trying to outbreed you [illegible]

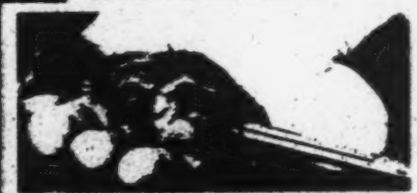
Tighten Up Get Rid of Unprofitable Equipment

ONE of the reasons given by Andrew Carnegie for his success as a steel leader was the fact that he never hesitated to scrap unprofitable equipment. His biographies tell of his building a new mill and ordering the entire mill torn down and rebuilt before he had ever used it to handle a pound of steel, because a more profitable process had been discovered. In small affairs, as well as in large, this same principle holds. A machine which causes loss should immediately be discarded and replaced by one which produces profit. Unprofitable equipment will overcome the hard work of the hatcheryman. It piles loss upon loss until it eventually sinks the business.

Follow the lead of the men who think clearly in business and discard a losing proposition immediately. Many incubators are not producing what they should in the way of salable chicks. Put a Smith machine to work in the space occupied by this unprofitable equipment and it will soon pay for itself and give you money besides.

Tighten Up On Chilled Chick Losses

WHEN we put a chick thermometer in the metal opening of a hatching chick under varying conditions, we discovered facts which we hardly believed ourselves, but which careful checking has proved to be correct. In experiments we exposed chicks that had just pulled out of the shell to a hatchery room temperature of 67° for two minutes. At the end of this period, we found that these newly-hatched chicks were chilled 20 or more and, in many cases, the body temperature was as low as 88°. It is not necessary for us to dwell on the fact that such chilling carries the utmost danger to the life of the chick. Even though death may not result, growth is retarded and losses are bound to follow. Can you afford to produce chicks which are not protected at all times from chilling temperatures?



A SMITH INCUBATOR NEVER CHILLS CHICKS

Tighten Up On Poor Hatches

MANY a hatcheryman has met with failure because of poor hatches. Obsolete and inefficient equipment has caused him to lose that extra five or ten percent which makes the profit. In the old days, sufficient margin existed between the production cost and the selling price to permit a low percentage of hatch and still have a profit, but now such is not the case. Today, chicks are produced on a smaller margin of profit. Hatcherymen who operate a Smith machine alongside other equipment have

Tighten Up

If You H

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If you sell chicks that are not properly hatched, dumb losses must follow and you will lose customers which cannot be readily replaced. Today, no hatcherymen is in position to gamble wrong twice. His product must hold the home trade or he will be out of business. Many hatcherymen who have Smith Incubators alongside machines of other types frankly say that they reserve the Smith-Hatched chicks for their home trade. They realize the importance of satisfying their home customers and have learned that Smith-Hatched chicks are best for that purpose. *TIGHTEN UP—Smith Equipment Makes Satisfied Customers And Is The Cheapest Business Insurance Any Hatcheryman Can Buy.*

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On Disease Spread

MOST successful hatcherymen are fumigating regularly and thus prevent disease spread. Remember that disease spreads in the hatchhouse only as hatching trays and fresh eggs chick to another. Disease germs are only released after the chick pips the shell. Hatching in a separate hatcher or in any other type of an incubator will not prevent the disease germs from being released from infected chicks when they hatch. Proper fumigation will kill these germs before the chicks drive and before the germs can be carried to other chicks. Disease germs are they, invisible specks which ride on dust particles or "downs". The "downs" itself, which is always present where chicks are hatching, is not harmful to the chicks. The germs of disease which are a problem in incubators will not infect eggs in any stage of incubation. They can only infect chicks after they pip the shell. Anyone who tells you that a separate hatcher or any type of an incubator will prevent the spread of disease is either trying to mislead you or is not familiar with actual schoolpit facts. The germs are present in any type of machine where diseased chicks are hatching. The problem is how to get rid of these germs most readily, and fumigation is the only solution that has been found. It is simple and easy in the Smith but not in all other chicks—in some incubators it is impossible.

Fumigation Protects You

Do not be misled by statements that fumigation is harmful to the chicks. On the contrary, if properly done in a Smith, it is actually beneficial and invigorating. The Smith Incubator is so constructed that the fumigating gases are carried quickly and uniformly to every part of the machine. The entire process is under control at all times, and it is not necessary to open the machine to carry on the work. The Smith Incubator has proven to be more easily and effectively fumigated than any other machine made.

Tighten Up

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If you are a hatcheryman who does custom hatching, you are fully aware of the awkward silence which greets the announcement of a poor hatch. You are also aware of the pleased smile which greets you when you bring out more chicks than the customer had expected. The Smith machine, because of its superior hatching method, helps you get that extra percentage of hatch which makes a profit and pleases your customers.

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A SMITH INCUBATOR NEVER CHILLS CHICKS

Tighten Up

On Replacements

THE hatchery industry has developed a reputation for extreme liberality on replacements. If your chicks are at fault you should replace them, but don't forget that every replacement you make is a loss to you. The margin of profit is so small that saved chicks must be sold at full price to equal the loss occasioned by replacing even one chick free of charge. The Smith Incubator helps reduce these replacements. A Smith-Hatched chick is stronger and better. It is properly hatched. It comes out of the incubator—the vitality unimpaired. It is protected against chilling at hatching time. It lives and grows vigorously and as a result you are free from the expense of replacement which follows hatching equipment losses.

If You Ha

DISEASE SPREA
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Tighten Up with a Smith!

DEFENDANT S' EXHIBIT No. 57
1424

What does it profit you

PAID

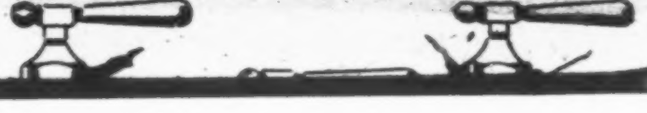
if you

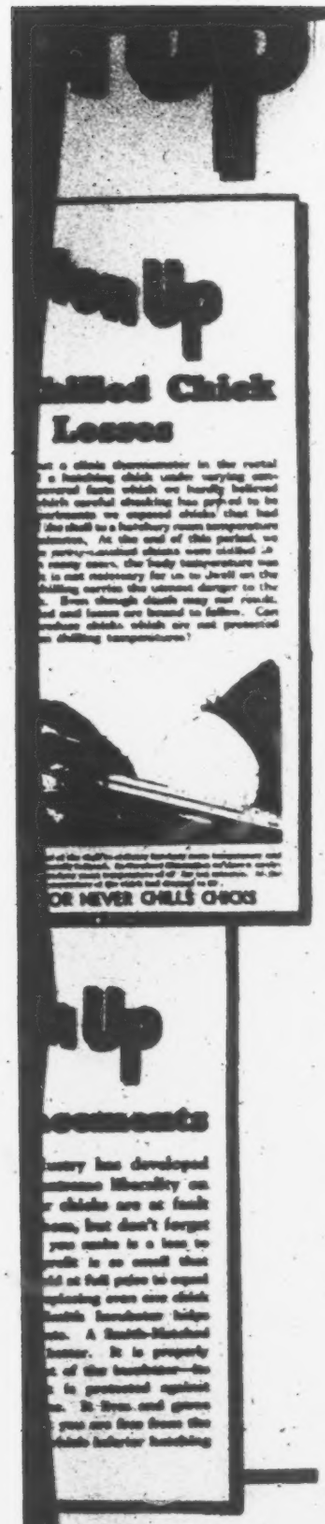
Work hard
all season—
day and night—
and still . . . .

If You Have These Expensive Leaks

you are not getting anywhere

Drip, drip, drip—just look how your profits can gradually seep away during the season. No big losses, perhaps, but when the last box of chicks is shipped and you look back on the season's operations, you wonder why you haven't made a cent. Some of the reasons are shown on this page. Study them. Then turn the page and read how you can tighten up and stop these expensive, money-losing leaks.





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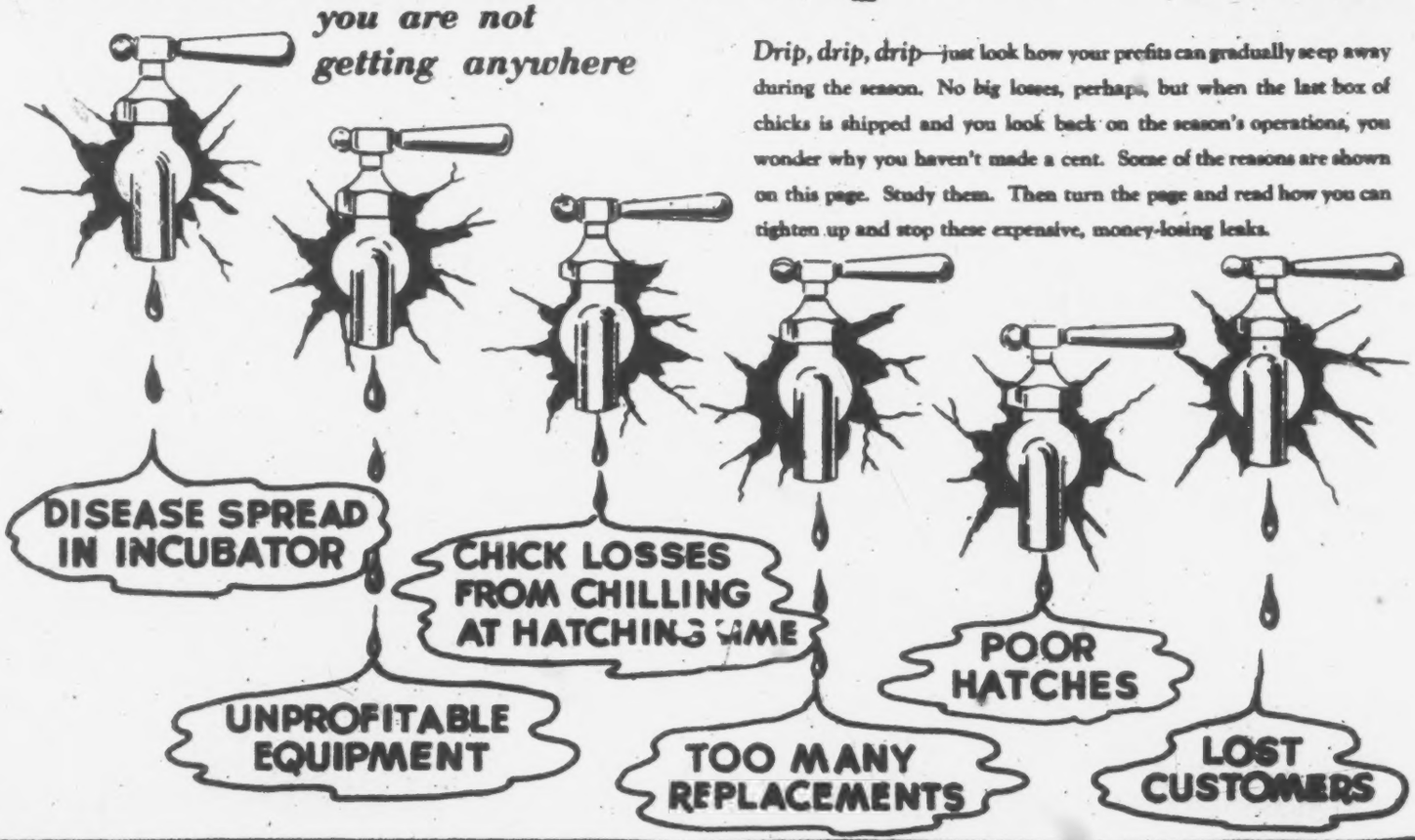

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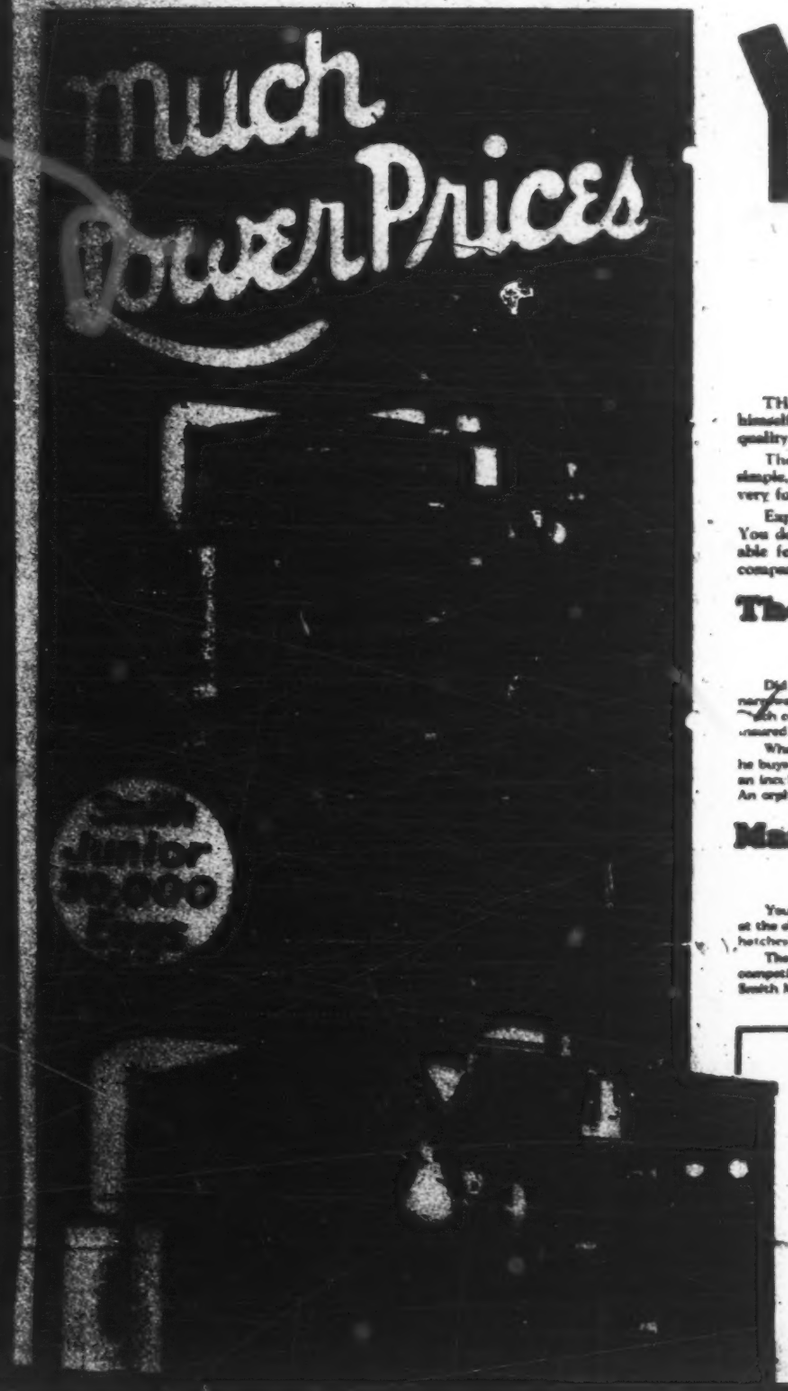

Your Profit-Maker Is

Down Goes the Cost of Producing C
When a Smith Incubator is Usec

THE DAY of easy money for the hatcheryman is gone. Today he must, first of all, equip himself with an incubator that will give him the highest hatching percentages and the best quality of chicks for the least amount of time, money and labor expended.

The race for existence among hatcherymen is on in dead earnest. It is a case, pure and simple, of the survival of the fittest. Survival cannot be insured unless you strengthen the very foundation of your business by equipping your plant with modern incubators.

Experience over a period of years has shown the Smith Machine to be the best producer. You do not need to take our word for this—ask a Smith user. Thousands of them are available for reference; many of them have tried the Smith alongside other equipment and by comparison have learned that no machine can equal the Smith as a profit-maker.

The Foundation of Your Business Success is the Incubator You Use

Did you ever wonder why the hundreds of automobile manufacturers which formerly existed have now narrowed down to a few companies? The answer is easy—people want cars backed by a big, strong company with continuous in business year after year, even after the car is worn out. They want to buy where they are assured of service and where they can get parts and replacements.

What chance has a hatcheryman to profit as he should from his incubator investment, if the machine he buys is liable to become an orphan? The time has come in the hatchery business to consider, in buying an incubator, whether or not the company which makes it will be in business as long as the machine lasts. An orphan incubator, like an orphan automobile, has no friends and will bring you a loss.

Many Hatcherymen Have Been Ruined by Poor Equipment

You have seen many hardworking hatcherymen labor day and night through the season, and come out at the end of the year with no money to show for their efforts. Their profits have dripped away through poor hatches, heavy replacements and excessive operating costs which brought the overhead above the profit line.

The answer to many a hatcheryman's financial trouble lies in up-to-date Smith Machines. You are competing with Smith equipment, and the only way to successfully meet such competition is to install a Smith Machine—there is a capacity to fit your needs.

Prices Tumble

In addition to the production of the last word in efficient incubation, Smith prices have been drastically reduced in conformity with the trend toward lower costs. Never before in the history of the trade has it been possible to buy the quality, the efficiency, the skilled engineering developments or the different egg capacities now possible to obtain in a Smith Incubator. The prices on Smith machines include prepaid freight and free installation. You owe it to yourself—your future success in the hatchery business—to thoroughly investigate the new Smith machines.

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Prices Tumble

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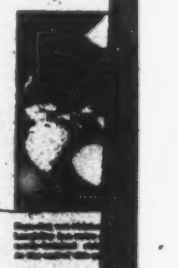
Trade In Old ...

In addition to drastically reduced ... you may trade in your present hatc... a worth-while allowance. Smith ha... enable every hatcheryman to equi... that will put him in the running in ... and keep him there.

Talk Over Your Problems With a Smith Representative

Feel free to talk over your hatchery problems with a Smith man. You will not be placed under obligation in any way, and you are sure to learn much of interest and value to yourself. Every Smith man is a thoroughly experienced man in the hatchery field. What he suggests or advises may be followed with confidence. He is keeping in constant touch with hatchery developments, and his advice is in every case based on practical knowledge and not on theory. Our men have just returned to their territories after a week's conference in Cleveland, and much of interest to the hatcheryman was discussed by our men from all sections of the United States. This extensive knowledge of conditions throughout the industry together with the best methods to improve these conditions, is therefore free for the asking to every hatcheryman who discusses his problems freely with a Smith man. Just mail the card—no obligation—and a Smith man will call to see you at your convenience.

Just Mail this Card



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This is No Time to Try to Make Unprofitable Equipment Do

Never in the history of America has so much thought and consideration been given to methods and means for getting production costs down to bed rock.

The hatching business is no exception to the rule. Every man in the chick producing business realizes that this is no time to try to make unprofitable equipment do. You cannot hope to stay in business if you get poor hatches and inferior chicks while your competitor is rolling out big hatches of salable chicks that live and grow. The man with Smith equipment has a big advantage in these times.

Smith machines are designed to meet today's demands for more profitable production of healthy, hardy chicks at the lowest cost per chick.

Your choice—fit your requirements as to capacity and housing space available.

Smith Junior, 30,000 eggs
New Smith Intermediate, 39,000 eggs
Smith Old Reliable, 52,000 eggs
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The Smith Incubator Has No Separate Hatcher

All sorts of rumors have been floating around the hatchery industry concerning our attitude toward a separate hatcher.

Exhaustive tests have conclusively shown that a separate hatcher adds to the labor cost because the chicks and eggs must be handled more frequently. Separate hatchers add to the chances for exposing the chicks to damaging temperatures and humidity changes. We have not found any separate hatcher which will add to the quality of chicks produced—nor will it produce any greater per cent of hatch. They are not more sanitary than most modern incubators, nor will they prevent disease spread.

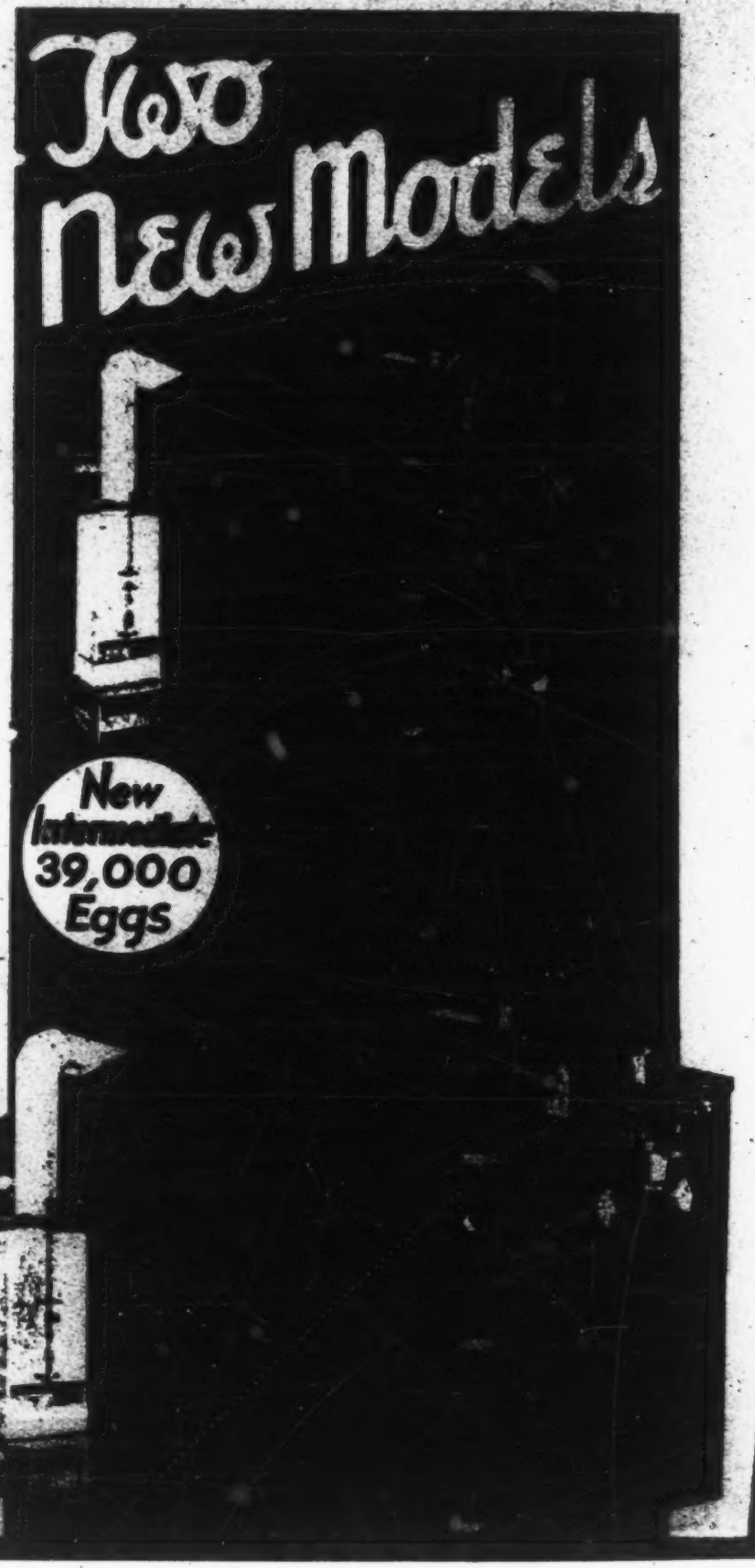
We believe a Smith machine produces a better chick than can be produced with any other type of equipment, and produces it at a lower cost per chick. Therefore our answer to the separate hatcher question is NO.

Liberal Terms

In a spirit of helpfulness to the hatchery profession, we extend extremely liberal terms of payment for Smith Incubators. The first payment is small, and you are allowed three years in which to pay the balance. What other equipment can you buy on such liberal terms?

Trade In Old Equipment

In addition to drastically reduced prices and liberal terms, you may trade in your present hatching equipment and receive a worth-while allowance. Smith leaves no stone unturned to enable every hatcherymen to equip himself with incubators that will put him in the running in a highly competitive field, and keep him there.



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Never in the history of America has so much thought and consideration been given to methods and means for getting production costs down to bed rock.

The hatching business is no exception to the rule. Every man in the chick producing business realizes that this is no time to try to make unprofitable equipment do. You cannot hope to stay in business if you get poor hatches and inferior chicks while your competitor is rolling out big hatches of salable chicks that live and grow. The man with Smith equipment has a big advantage in these times.

Smith machines are designed to meet today's demands for more profitable production of healthy, hardy chicks at the lowest cost per chick.

Four sizes—fit your requirements as to capacity and housing space available.

Smith Junior, 30,000 eggs
New Smith Intermediate, 39,000 eggs
Smith Old Reliable, 52,000 eggs
New Smith Giant, 65,000 eggs

The Smith Incubator Has No Separate Hatcher

All sorts of rumors have been floating around the hatchery industry concerning our attitude toward a separate hatcher.

Exhaustive tests have conclusively shown that a separate hatcher adds to the labor cost because the chicks and eggs must be handled more frequently. Separate hatchers add to the chances for exposing the chicks to damaging temperature and humidity changes. We have not found any separate hatcher which will add to the quality of chicks produced—nor will it produce any greater per cent of hatch. They are not more sanitary than most modern incubators, nor will they prevent disease spread.

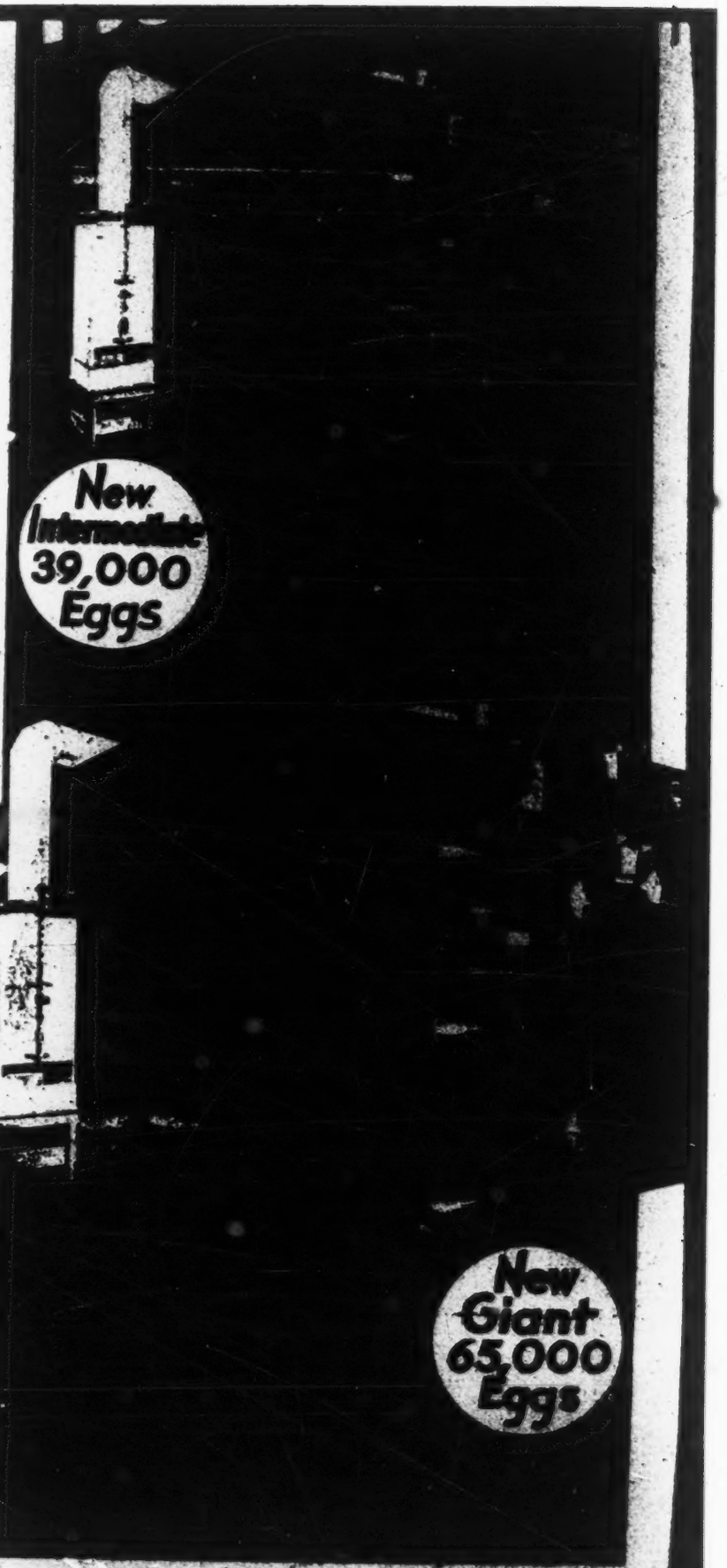
We believe a Smith machine produces a better chick than can be produced with any other type of equipment, and produces it at a lower cost per chick. Therefore our answer to the separate hatcher question is NO.

Liberal Terms

In a spirit of helpfulness to the hatchery profession, we extend extremely liberal terms of payment for Smith Incubators. The first payment is small, and you are allowed three years in which to pay the balance. What other equipment can you buy on such liberal terms?

Trade In Old Equipment

In addition to drastically reduced prices and liberal terms, you may trade in your present hatching equipment and receive a worth-while allowance. Smith leaves no stone unturned to enable every hatcheryman to equip himself with incubators that will put him in the running in a highly competitive field, and keep him there.



...Your Problems ...Representative

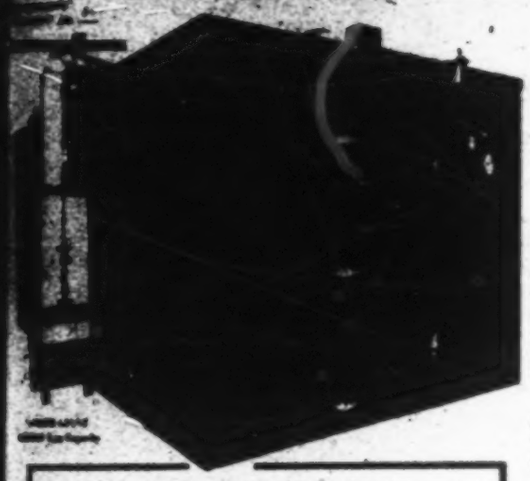
...problems with a Smith man. You will not be placed ...o more to learn much of interest and value to yourself. ...ssed men in the hatchery field. What he suggests ...ost. He is keeping in constant touch with hatchery ...ems based on practical knowledge and not on theory. ...ecides after a week's conference in Cleveland, and ...discussed by our men from all sections of the United ...ntry throughout the industry together with the best ...ggestions free for the asking to every hatcheryman ...Smith man. Just mail the card—no obligation—and ...convenience.

Just Mail this Card

THIS NEVER HAPPENS IN A SMITH INCUBATOR

...H INCUBATOR CO. . . . Cleveland, Ohio

Smith Hatches Best Because Eggs are NEVER Disturbed During Critical Period 18th Day to Pipping Time



Another Scientific Reason Why Smith Research Has Continually Advised Against Separate Hatchers and all other methods where retraying on the 18th day is necessary

You cannot dodge facts. You cannot rely on theory. You cannot follow unproven methods safely. These emphatic statements should be of more than passing interest to hatcherymen who are all without a single exception in the very midst of changing conditions which have no parallel in the entire history of the industry.

The facts about better hatching—even if they do appear old ideas—are given to the industry by Smith Research only after the most careful and painstaking scientific study. Nothing is ever taken for granted. A contribution is never accepted hastily. That is why we maintain our Research Department and study hatchery problems year after year.

On warm days, you enjoy a breeze as long as that breeze is cool, but strong or hot you cool.

In the Smith, the eggs are comfortable—the temperature and the air movements are designed to keep them comfortable.

This is particularly important on the 18th and 19th days of incubation when the greatest death loss in the shell occurs. If this critical period, the eggs are true to three degrees warmer than the incubator temperature and naturally are cooled by the air which moves around them. They are susceptible to temperature changes that air gaps or holes in the egg formations in the trays have a definite bearing on the hatchability of otherwise good eggs.

Doesn't this careful, scientific research prove to you that any method of hatching which involves the moving or disturbance of eggs during the critical period means a decrease in hatching percentages? We think you will agree that it does.

We have stated repeatedly, and say so again, that we do not consider a Smith Incubator merely as so much wood, metal and wiring. We look at it rather as a modern, scientific achievement for the production of the greatest number of saleable chicks at the lowest cost. Such an achievement could not possibly be represented in terms of materials. It must and is represented by the feathers we have made the facts we have discussed which are gladly and freely passed along for the betterment of the hatchery industry.

Doesn't Your Better Business Judgment Suggest the Advantages of a Smith Incubator and the Advisability of Having the Smith Organization Constantly Helping You With Your Problems?

The Smith Incubator from the smallest to largest represents equipment which a hatcherymen may have installed by factory experts to place him in a position whereby he may take full advantage of the suggestions and service of the Smith Organization. However, the discoveries made by the Smith Research Department are offered freely to the whole hatchery industry. In these days of competition still led by the hatcherymen based on the intelligent hatcherymen. He must get up-to-date in his methods and equipment or pass out of the picture. We offer our services to all who are progressive, anxious to learn and get ahead.

Let Smith Protect You on Possible Price Increases

There is a possibility every lifting costs ... prices today. The rise is being felt in many branch of industry, and hatcheries are no exception to the rule. No price would be appreciated. Whatever our hatcherymen may be ... equipments, and should ready and willing to protect you on possible price increases. If you get in touch with us at once.

We will help your cause money as well as quicker money.

Liberal Terms

Real, of reasonable ready cash proof and should between you and a Smith Incubator. You may buy on the basis of extremely liberal ... The first payment is small, and you are allowed ... years to pay the balance. In addition we will make a worth ... allowance for your old equipment. Smith leaves no stone ... between a hatcherymen to enjoy the benefits and advantages ... Smith Incubator. We will ... how you to plan your way to ... the profits of hatching.

There is a Smith Model to Suit Every Need

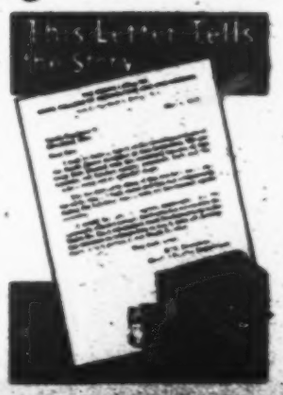
Having an incubator besides the careful consideration of location, need of operation and the company behind the machine you buy. The Smith takes first place upon just this capacity. There any other machine on the market. Operators of Smith Incubators have favorably many expressions of satisfaction greater than by the low cost of essential non-complicated labor required.

Smith Pays the Freight and Installs

Smith Incubators, too, are being widely established because of its quick response to any need of thousands. Smith pays the freight, and all hatcheries are made by factory men. As different dealers, other incubator manufacturers does this.

There isn't a single, solitary reason why you shouldn't have a Smith. There is a capacity to suit every requirement.

Smith Junior	10,000 Eggs
Smith Intermediate	20,000 Eggs
Smith Old Reliable	30,000 Eggs
Smith Giant	60,000 Eggs



Today the opportune thought in the mind of every thinking hatcherymen is to know labor and business advantages of hatch. Every item of information leading to the production of more quality chicks at an increase in workmanship, plus the most economical care and management in the handling industry.

The announcement, therefore, comes of a very important item. It not only serves to improve the industry with the most vital and useful research that is being continually conducted by The Smith Incubator Company, but also gives to you that this company does not hesitate to continue their forward position when such a course will open the way for more profit for the hatcherymen who own Smith machines.

• • • •

Every hatcherymen who operates Smith Incubators owes duty to enthusiastically endorse Smith service. It is admitted that a Smith Incubator is only a means to an end. Its main asset pride for the man or woman who employs business of hatching chicks. This chick business is highly specialized full of problems—subject to constant study, good experimentation.

So our readers these facts more keenly than The Smith Incubator Company, and this publication is home and more ... in the whole hatching industry when our Research Department says "Watch Us on the Hatchmark Page."

Free Insurance

All purchasers of hatchery equipment ... Smith users or users, small and large hatcheries of all either number sold by us this year, will hereafter receive insurance free of charge for the first year. This policy of The Smith Incubator Co. will represent a saving of many dollars to hatcherymen buying equipment from Smith this year.

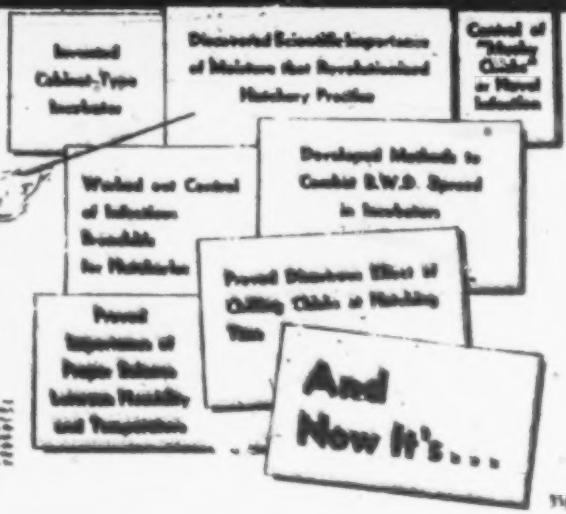
After the first year the insured portion of the machine will be insured free by this company, and if the hatcherymen desires, his paid-up equity may also be insured through The Smith Incubator Co. at a much reduced rate. In fact, it is about half the regular rate.

Owners of incubators, whether new or used, bought previous to this time, will be given the advantage of this same insurance saving as soon as their present insurance expires.

Just Mail this Card

NO MORE 18th Day TEST

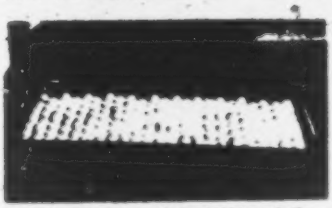
Once Again Smith Research Takes a Step Forward in the Science of Incubation

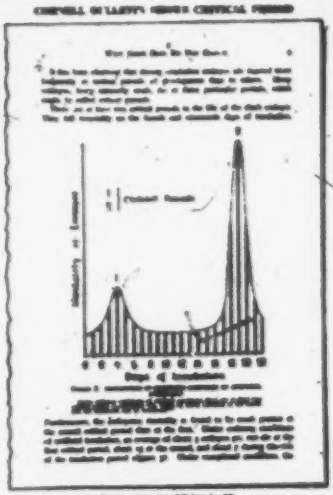


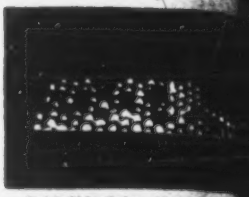
1427

HANDS OFF ON THE EIGHTEENT

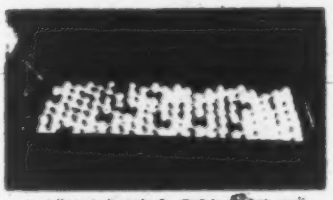
Read Why the 18-Day Test Tends Reduce the Percentage of Hat

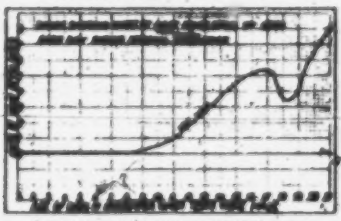






Uniformity of Air Circulation Important





Leave Infertile Eggs in Trays Until Hatch is Over

You Get a Better Percentage of Hatch—Proved by Years of Research

[fol. 1429] DEFENDANTS' EXHIBIT No. 39

(Letterhead of)

The Smith Incubator Company, 3108 West 121st Street, Cleveland, Ohio

October, 1930.

DEAR HATCHERYMAN:

The accompanying new catalog describes the Smith incubator. It is sent so that you may become familiar with the important improvements in this year's models—both steam and electric. These improvements are listed on Page 23.

R That it is only in Smith incubators that you can positively control the proper balance of temperature and moisture, so necessary to
E the production of big, strong, livable chicks.
That fumigation to check the spread of
M B.W.D. during the hatching period is now recommended by many government authori-
E ties. It is a simple matter to fumigate Smith incubators in an efficient, practical and easy
M manner.
That the purchase price includes prepaid
B Freight charges and the free erection of Smith machines in your hatchery.
E That Smith Service is the greatest and finest co-operation in the hatchery industry.
R This service is freely given without charge. It will aid in making your hatchery business profitable and successful.

Read the story of Smith installations that starts on Page 10. This chapter, showing the purchases of Smiths year [fol. 1430] after year by the foremost commercial hatcherymen, pictures better than words can tell the well-known fact that Smith operators are successful and make money.

If you are planning on increasing your incubator capacity or replacing old or unsatisfactory equipment, give us the

opportunity of further explaining Smith incubators to yo
We shall be glad to do this without any obligation. On
of our representatives is near you.

Very truly yours, The Smith Incubator Company
(Signed) C. R. Jenney.

CRJ:LFC.

(Here follows one photo, side folio 1431)

The Science of Incubation Makes Giant Strides

Incubation has just recently found its "seven-league boots." For thousands of years eggs were hatched in the same old way in incubators utilizing time-worn methods. Only a few minor changes occurred up until the twentieth century. The changes in incubation methods in the past fifteen years have not only revolutionized poultry production but have been notable for the scientific facts that have been brought to light.

Since 1922 The Smith Incubator Company have led the field in the production of the highest type of incubator equipment. Since that time they have also constantly carried on research in incubation methods under the direction of experts. To Mr. Joseph I. Taggart and Mr. T. S. Townsley goes the credit for as original and important scientific research work as has been made in any industry.

Unsatisfied with outworn ideas, these two men have shattered precedents and gotten down to "brass tacks" on incubation. Nothing was taken for granted. Each step was checked carefully in the laboratory and in collaboration with experts from educational and other fields. The ideas then developed were tested in the final crucible—actual hatchery operation.

Humidity

Their first discovery was the relation of moisture content of the air in the incubator to the percentage of chicks hatched and their health. The exact degrees of temperature were determined for best results. Scientific instruments for the determination of humidity were made a standard part of Smith equipment, and a definite method of moisture control installed. This work, naturally, led to the next step . . .

THE CORRELATION OF Humidity and Temperature

Here it was found that heat must be accurately and scientifically kept in balance with humidity, in order to bring eggs out on time and to hatch every hatchable egg. Better hatches of higher quality chicks resulted when there was a proper balance between humidity and heat—another milestone reached—and balanced control of these two factors of successful incubation was made a feature of all Smith incubators.

Bulletins and special instruction sheets were furnished to hatcherymen to enable them to carry on satisfactory incubation. The results have been—bigger hatches, better quality, more profits for the hatchery industry.

Fumigation

The disease of bacillary white diarrhea offered an ever-increasing problem in hatchery operations. In several quarters, half-hearted efforts were made to obviate this menace. It was proved by the United States Department of Agriculture and state universities that bacillary white diarrhea was spread in all types of incubators—it played no favorites.

Quickly and sensibly The Smith Incubator Company set to work, with the result that fumigation was made a standard practice in Smith machines. Due to the Smith system of positive ventilation, fumigation with formaldehyde gas, while the hatch was coming off, was recommended. After this had been proved in different sections of the country, it was tested and tried under rigid supervision by leading state universities. Their whole-hearted endorsement of this method of disease prevention is a testimonial to the scientific work done by the Smith organization.

—and Now

After years of work along incubation lines, the newest findings of the research department are shaking fixed ideas and blazing new trails in the science of incubation.

Here is written a new page in the history of your industry. Simple facts that have been dug out and presented to the hatchery industry to help them do a more profitable business year in and year out. Read about them on the next page.

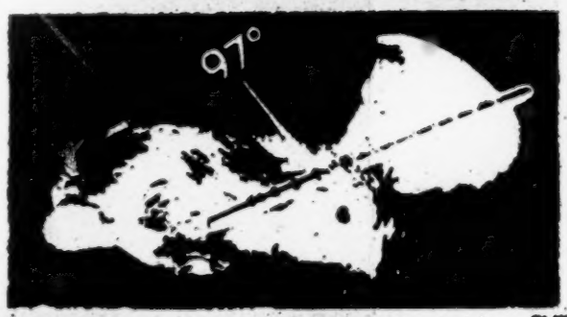
MR. TOWNSLEY

The First Ten Days—

The first ten days that an egg is in an incubator the temperature of the embryo is practically the same as the incubator temperature. As incubation advances, the embryo takes on a temperature of its own, and, by the twentieth day it may be two to three degrees warmer than the incubator.

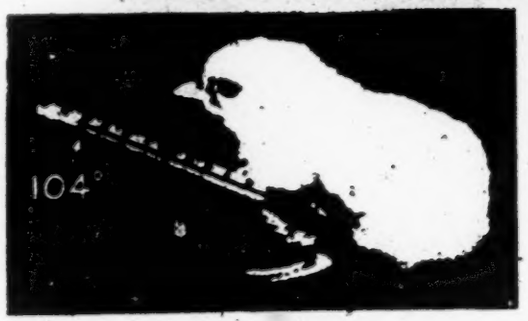
After the Chick Pips—

After the chick pips, its temperature is largely influenced by the humidity of the air which it breathes. If eggs in this condition are exposed to ordinary hatchery room air, the chicks' temperature drops as shown at the left.



Danger!

Many chicks are seriously damaged by exposing them to dry atmosphere the first few hours that they are out of the shell. The wet down acts like a wet bulb thermometer, and the body temperature of the chick will drop several degrees under ordinary hatchery room conditions.



A Normal Chick Just Dried Off

Chilling

Chilling of the chicks between the time they pip the shell and the time they have thoroughly dried is a serious matter and frequently causes poor development and sometimes heavy mortality in the weeks that follow. This is what happens when trays of hatching chicks are pulled out into the hatchery room for inspection.

When you work inside the Smith, the chicks are inspected from time to time without chilling because you do not subject them to the dry air of the hatchery room. No hatcheryman can afford to chill his chicks several degrees during this period.

[fols. 1432 & 1433] DEFENDANTS' EXHIBIT No. 43

This contract executed in duplicate.

Settlement Agreement Between Samuel B. Smith and the Buckeye Incubator Manufacturing Company

This Agreement, made and entered into this second day of March, 1933, between Samuel B. Smith, of Cleveland, Ohio (hereinafter called "Smith"), party of the first part, and The Buckeye Incubator Manufacturing Company, an Ohio corporation (hereinafter called "Buckeye"), party of the second part,

Witnesseth:

Samuel B. Smith and The Buckeye Incubator Company, an Ohio corporation, entered into a written agreement, dated April 29, 1927, whereby Smith granted to said The Buckeye Incubator Company the right to manufacture and sell incubators and incubating units of the capacity specified in said agreement under United States Patents Nos. 1262860, 1263138 and 1543130, and Canadian Patents Nos. 217777 and 217778, which patents were each and all owned and are still owned by Smith; and which said agreement has been assigned and is now owned by The Buckeye Incubator Manufacturing Company, party of the second part hereto. A controversy has arisen between said Smith and Buckeye relating to the manufacture by Buckeye of a separate hatcher, which, when it is used in conjunction or combination with an incubator or incubating unit covered by the [fol. 1434] Smith patents, Smith claims is a violation of the contract and license of April 29, 1927.

The parties are desirous of settling said controversy and all other claims now existing by each against the other, and for the purpose of settling said controversy have agreed and do hereby mutually agree as follows:

1. Said Smith agrees that the separate hatcher, as a distinct unit, as defined in the next succeeding paragraph herein, heretofore and now being manufactured by Buckeye and sold to the trade by The Buckeye Incubator Company, a Delaware corporation, the sales company for Buckeye, is not covered by any of the terms or specifications of any patents heretofore granted to said Smith by the United States Government and the Dominion of Canada, and especially United States Patents Nos. 1262860, 1263138 and

1543130, and Canadian Patents Nos. 217777 and 217778, and that the separate hatcher as a distinct unit, as defined herein, does not infringe any of the claims of said patents, and this paragraph applies to said separate hatcher, whether used with an incubator or incubating unit manufactured under any of the fo· ·ing patents, or used indepently of any such incubato. . incubating unit.

The term "separate hatcher" is hereby agreed to mean a cabinet capable of maintaining a proper temperature and moisture condition wherein the eggs are all in one stage of incubation and to which the eggs from an incubator or incubating unit are transferred when it is no longer necessary to turn them.

It is understood and agreed that in the event any person, [fol. 1435] firm or corporation other than Buckeye and/or The Buckeye Incubator Company makes, uses or sells a separate hatcher which said Smith feels could be used in conjunction or combination with an incubator or incubating unit and which said Smith feels infringes said United States Patents Nos. 1262860, 1263138 and 1543130, and said Canadian Patents Nos. 217777 and 217778, said Smith shall have the right to and shall prosecute all such infringers, shall pay all the expenses of such prosecution, and shall receive all recoveries therefrom, in which prosecution Buckeye shall render all necessary assistance at the expense of said Smith.

2. Buckeye has heretofore failed to pay royalties upon incubators and/or incubating units manufactured by it which Smith claims are covered by patents owned by him hereinbefore described. Buckeye hereby agrees to pay to Smith the sum of Forty-five Thousand Forty-one Dollars and Fifty-seven Cents ($45,041.57), in full payment of all royalties accrued on said incubators and/or incubating units so shipped by it up to and including December 31, 1932, said payments to be made to said Smith by Buckeye on the following dates and in the following amounts, the same to be evidenced by separate promissory notes executed by Buckeye as of January 1, 1933, bearing interest at the rate of six (6) per cent. per annum from said date:

March 20, 1933	$1250.00
April 20, 1933	2000.00
May 20, 1933	2000.00
June 20, 1933	2000.00

[fol. 1436] July 20, 1933	2000.00
August 20, 1933	1250.00
September 20, 1933	1250.00
October 20, 1933	1250.00
November 20, 1933	1250.00
December 20, 1933	1250.00
January 20, 1934	1250.00
February 20, 1934	1250.00
March 20, 1934	1250.00
April 20, 1934	2000.00
May 20, 1934	2000.00
June 20, 1934	2000.00
July 20, 1934	2000.00
August 20, 1934	1250.00
September 20, 1934	1250.00
October 20, 1934	1250.00
November 20, 1934	1250.00
December 20, 1934	1250.00
January 20, 1935	1250.00
February 20, 1935	1250.00
March 20, 1935	1250.00
April 20, 1935	2000.00
May 20, 1935	2000.00
June 20, 1935	2000.00
July 20, 1935	1791.57

In the event Buckeye shall at any time fail to pay the sums aforesaid as set forth herein on their due dates, this contract and the contract of April 29, 1927, shall be terminated at the election of said Smith in the manner set forth in paragraph 1, section 6 (entitled "Default") of the contract of April 29, 1927.

The scale of royalties for all incubators and/or incubating units manufactured under said Smith patents here- [fol. 1437] inbefore referred to, and the capacities of all such incubators and/or incubating units sold and shipped from January 1, 1933, shall be the same as now in force and as set forth in said contract of April 29, 1927, and the provisions pertaining to the payment of said royalties shall be the same as therein set forth, it being expressly understood and agreed between the parties that the payment of said Forty-five Thousand Forty-one Dollars and Fifty-seven Cents ($45,041.57) is for accrued royalties on incubators and/or incubating units sold and shipped by

Buckeye up to and including December 31, 1932. In the case of any such incubators and/or incubating units which have been sold prior to January 1, 1933, but are not shipped until or after January 1, 1933, the scale of royalties as set forth in the contract of April 29, 1927, shall apply and be paid.

3. This agreement having been entered into for the purpose of mutually settling any pending controversies between the parties hereto, Smith hereby releases Buckeye and The Buckeye Incubator Company, and Buckeye hereby releases Smith, The Smith Incubator Company and The Smith Incubator Manufacturing Company from all claims for damages, actions, causes of action of whatsoever kind and nature, and particularly for violation of all prior or existing contracts or infringements, excepting only said payment by Buckeye of accrued royalties as hereinbefore set forth, in the sum of Forty-five Thousand Forty-one Dollars and Fifty-seven Cents ($45,041.57), on the dates set forth in paragraph 2 hereof, and Smith and Buckeye further release any and all claims against any customers of [fol. 1438] the other, except claims which Smith may have based on unauthorized structural changes made by any customer.

It is intended hereby, and Buckeye does release said Smith, The Smith Incubator Company and The Smith Incubator Manufacturing Company from all claims for damages, actions or causes of action of every kind and description arising from or out of the sale, resale or acceptance in trade of Buckeye incubators and/or incubating units by said Smith, The Smith Incubator Company and The Smith Incubator Manufacturing Company.

It is hereby further mutually agreed between the parties hereto that Buckeye and/or The Buckeye Incubator Company may accept in trade and resell Smith incubators, and Smith, The Smith Incubator Company and/or The Smith Incubator Manufacturing Company may accept in trade and resell Buckeye incubators from this date, both parties agreeing that this right will exist to each and all of the parties named in this paragraph from this date until the expiration of the Smith patents previously referred to herein.

4. Smith and Buckeye agree that they will cause the suit now pending in the United States District Court for the

Northern District of Ohio, Eastern Division, No. 4022 In Equity, to be marked "Settled and Dismissed without cost," it being expressly agreed herein that each party will pay its own costs and expenses incurred by said suit.

5. This agreement herewith incorporates the provisions set forth in the contract and license of April 29, 1927, the [fol. 1439] same as if said provisions were fully rewritten herein, and in no way alters or changes any of the provisions or conditions of that contract, except as specifically provided herein.

6. This agreement shall inure to the benefit of and be binding upon the heirs, administrators, executors, trustees, successors and assigns of the parties hereto, even where the same have not been herein specifically named.

In Witness Whereof, the parties hereto have hereunto affixed their signatures at Cleveland, Ohio, the day and year first above written, the execution of this contract on behalf of The Buckeye Incubator Manufacturing Company having been first duly authorized by its Board of Directors.

The Buckeye Incubator Manufacturing Company,
by (Signed) A. R. Hill, V. Pres. and Treas.
(Signed) Samuel B. Smith.

Witnesses: (Signed) A. L. Sandberg. (Signed) Thomas F. Patton.

[fol. 1440] Fullington Patent No. 1,205,445 is incorporated herein with patents comprising Defendants' Exhibit No. 10, found at page 1287 of this volume.

1146

Aug. 4, 1925. 1,548,478

J. L. NIX

EGG TRAY

Filed Jan. 28, 1924

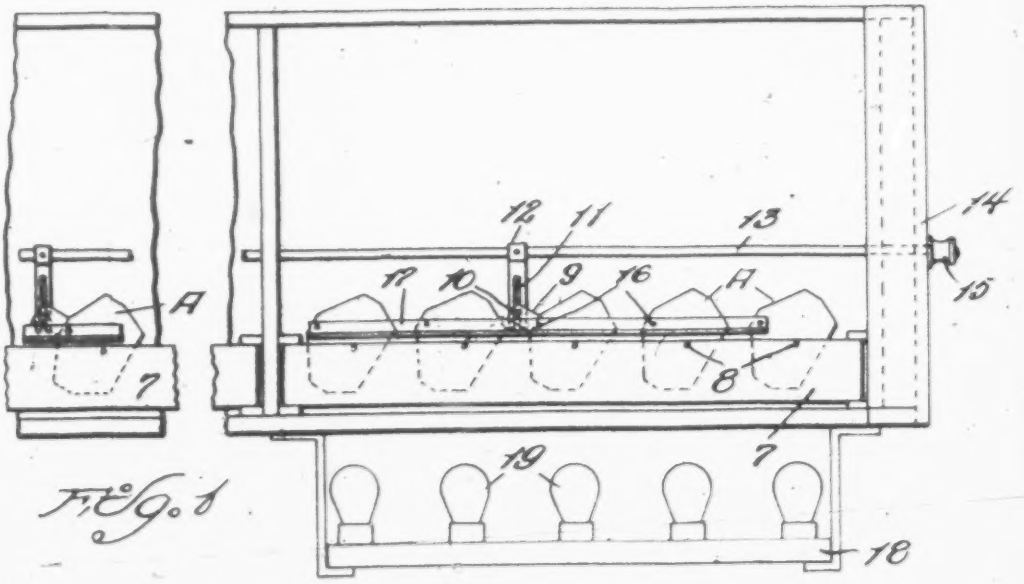


Fig. 1

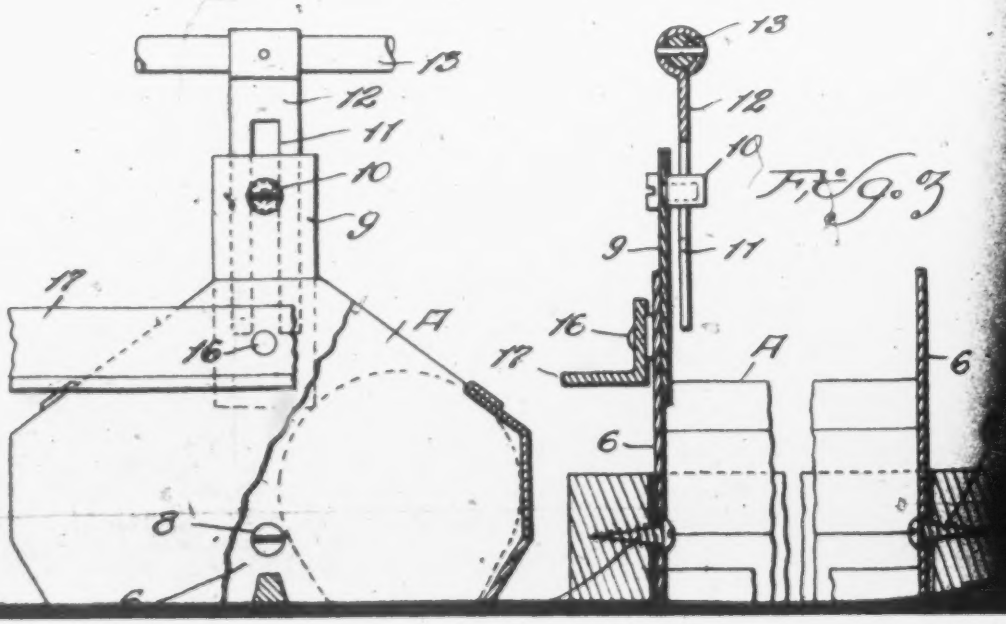


Fig. 3

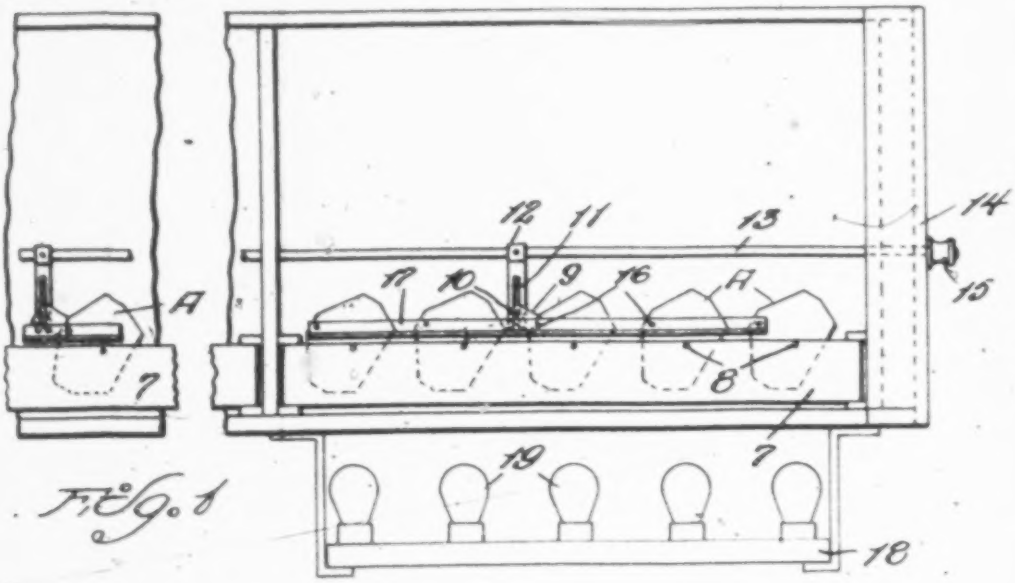


Fig. 1

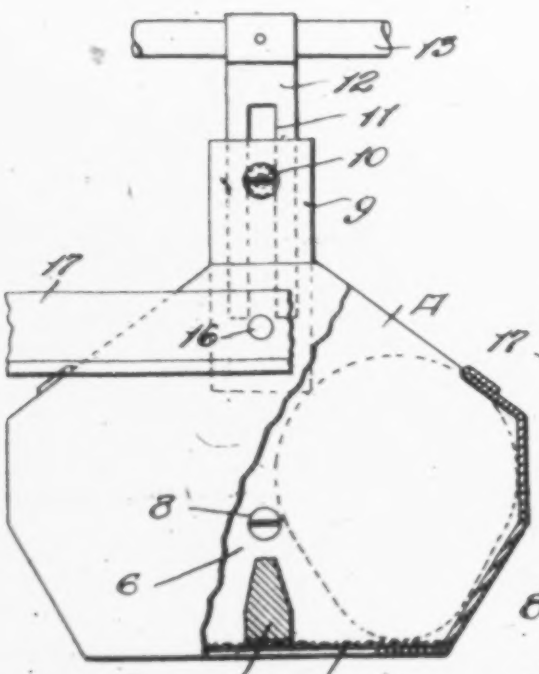


Fig. 2

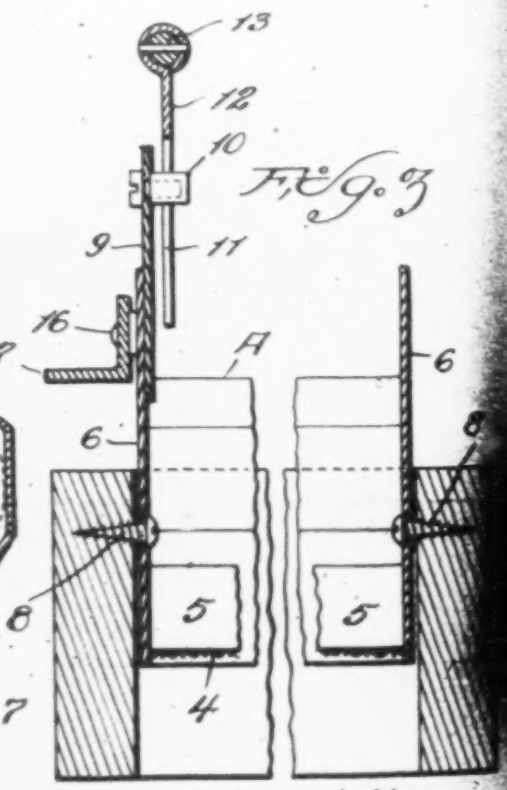


Fig. 3

INVENTOR JAMES L. NIX,

By James L. Hopkins, Attorney

Patented Aug. 4, 1925. 1,548,478

UNITED STATES PATENT OFFICE.

JAMES L. NIX, OF HOMER CITY, PENNSYLVANIA.

EGG TRAY.

Application filed January 28, 1924. Serial No. 688,906.

To all whom it may concern:

Be it known that I, JAMES L. NIX, a citizen of the United States of America, residing at Homer City, in the county of Indiana and State of Pennsylvania, have invented certain new and useful Improvements in Egg Trays, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to an improved egg tray for use in incubation and has for its object to provide a tray having turning means, which turning means are disconnected by the operation of withdrawing the tray from the incubator; the tray also having egg compartments provided with perforate bottoms, enabling the eggs to be tested without removal from the tray.

The tray of my invention provides for holding the eggs on end with the result of increasing the egg carrying capacity of the tray; while the eggs lie in the proper position, approximately the horizontal for incubating being successively carried with their opposite sides uppermost.

Other advantages incident to my invention will be apparent from the following description.

Drawings.

Fig. 1 is a transverse vertical view of an apparatus embodying my invention.

Fig. 2 is an enlarged detailed end view of the center receptacle of each egg tray.

Fig. 3 is a detailed view illustrating the contact between the center receptacle shown in Fig. 2 and the operating rod by which the egg receptacles are turned.

Description.

As shown in the drawing I provide a series of elongated cradles A, having bulging parallel sides of the form illustrated in Figs. 1 and 2, wherein the eggs are deposited in vertical position as shown in fixed upon the transverse rod 13 which extends through the wall 14 of the incubator and terminates in a knob 15. In each of the drawers 7 the cradles A are connected to each other by pintles 16 extending into the connecting bar 17. A transverse rack 18 carries electric lamps 19, one lamp for each of the cradles A. Bottoms 4 of said cradles A being perforate, the eggs may be tested as to fertility and life by pulling the drawer 7 outwardly so that each of the eggs may be viewed downwardly against the light of the lamps 19 without removal of the egg from the cradle A wherein it rests.

Mode of operation.

The drawer 7 may be withdrawn at pleasure for the purpose of examining its contents, its initial outward movement drawing the prong 10 out of contact with the slot 11, the rod 13 and its attached bar 12 remaining in place.

The position in which the eggs are held within the cradles A, as above described, is the ideal position for incubating (see Fig. 1) and the turning is effected by a single pull or thrust upon the knob 15 to the limit of its movement in the desired direction.

I have illustrated and described the preferred embodiment of my invention, and the drawing and description are not intended to be construed as limiting my invention but merely as illustrative thereof. Structural changes can be made without departure from my invention as defined in the following claims.

I claim—

1. An egg tray composed of cradles each having bulging parallel sides contoured and spaced to receive eggs in pairs and standing on end; a perforate bottom; a longitudinal parting strip mounted in contact with said bottom; and ends supporting the cradles and pivotally mounted at a point in alinement with the center of gravity of the cradle; in combination with a reciprocating mechanism

To all whom it may concern:

Be it known that I, JAMES L. NIX, a citizen of the United States of America, residing at Homer City, in the county of Indiana and State of Pennsylvania, have invented certain new and useful Improvements in Egg Trays, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to an improved egg tray for use in incubation and has for its object to provide a tray having turning means, which turning means are disconnected by the operation of withdrawing the tray from the incubator; the tray also having egg compartments provided with perforate bottoms, enabling the eggs to be tested without removal from the tray.

The tray of my invention provides for holding the eggs on end with the result of increasing the egg carrying capacity of the tray; while the eggs lie in the proper position, approximately the horizontal for incubating being successively carried with their opposite sides uppermost.

Other advantages incident to my invention will be apparent from the following description.

Drawings.

Fig. 1 is a transverse vertical view of an apparatus embodying my invention.

Fig. 2 is an enlarged detailed end view of the center receptacle of each egg tray.

Fig. 3 is a detailed view illustrating the contact between the center receptacle shown in Fig. 2 and the operating rod by which the egg receptacles are turned.

Description.

As shown in the drawing I provide a series of elongated cradles A, having bulging parallel sides of the form illustrated in Figs. 1 and 2, wherein the eggs are deposited in pairs in vertical position as shown in Fig. 2. The cradle has a perforate bottom 4 and a longitudinal separating strip 5 mounted along the length of said bottom. The end plate 6 is pivoted in place within the drawer 7 as indicated by 8. I prefer to use an odd number of said cradles A in each of the drawers 7, the center cradle in each drawer (illustrated in Fig. 2) having a vertical arm 9 provided with an inwardly projecting prong 10 extending into and riding in the slot 11 of the arm 12. The bar 12 is fixed upon the transverse rod 13 which extends through the wall 14 of the incubator and terminates in a knob 15. In each of the drawers 7 the cradles A are connected to each other by pintles 16 extending into the connecting bar 17. A transverse rack 18 carries electric lamps 19, one lamp for each of the cradles A. Bottoms 4 of said cradles A being perforate, the eggs may be tested as to fertility and life by pulling the drawer 7 outwardly so that each of the eggs may be viewed downwardly against the light of the lamps 19 without removal of the egg from the cradle A wherein it rests.

Mode of operation.

The drawer 7 may be withdrawn at pleasure for the purpose of examining its contents, its initial outward movement drawing the prong 10 out of contact with the slot 11, the rod 13 and its attached bar 12 remaining in place.

The position in which the eggs are held within the cradles A, as above described, is the ideal position for incubating (see Fig. 1) and the turning is effected by a single pull or thrust upon the knob 15 to the limit of its movement in the desired direction.

I have illustrated and described the preferred embodment of my invention, and the drawing and description are not intended to be construed as limiting my invention but merely as illustrative thereof. Structural changes can be made without departure from my invention as defined in the following claims.

I claim—

1. An egg tray composed of cradles each having bulging parallel sides contoured and spaced to receive eggs in pairs and standing on end; a perforate bottom; a longitudinal parting strip mounted in contact with said bottom; and ends supporting the cradles and pivotally mounted at a point in alinement with the center of gravity of the cradle; in combination with a reciprocating mechanism for said cradles having sliding engagement with one of said cradles and arranged to be disconnected therefrom by the withdrawal of said tray from its seat.

2. An egg tray composed of cradles having bulging parallel sides contoured and spaced to receive eggs in pairs and standing on end; a perforate bottom; a longitudinal parting strip mounted in contact with said bottom; and ends supporting the cradles

and pivotally mounted at a point in alinement with the center of gravity of the cradles; in combination with a reciprocating mechanism for said cradles having engagement with the cradles when seated in operative position and arranged to be disengaged therefrom by the withdrawal of the tray from its seat.

3. In an incubator, in combination with an incubator drawer, an egg-tray composed of a plurality of cradles; a reciprocating connecting bar for said cradles; a reciprocating mechanism for said cradles mounted in said incubator, having sliding engagement with one of said cradles and arranged to be disengaged therefrom by the withdrawal of the tray from its seat.

4. An egg tray consisting of a plurality of cradles, each cradle having a perforate bottom; two end plates and bulging parallel sides, said end plates and sides being contoured for the reception of two rows of eggs arranged in pairs; a longitudinal parting strip fixed in said cradles and arranged to separate said rows of eggs; in combination with a reciprocating mechanism for said cradles arranged to engage with said cradles when the tray is seated and to be disengaged from said cradles by the withdrawal of the tray from its seat.

In testimony whereof I have hereunto affixed my signature.

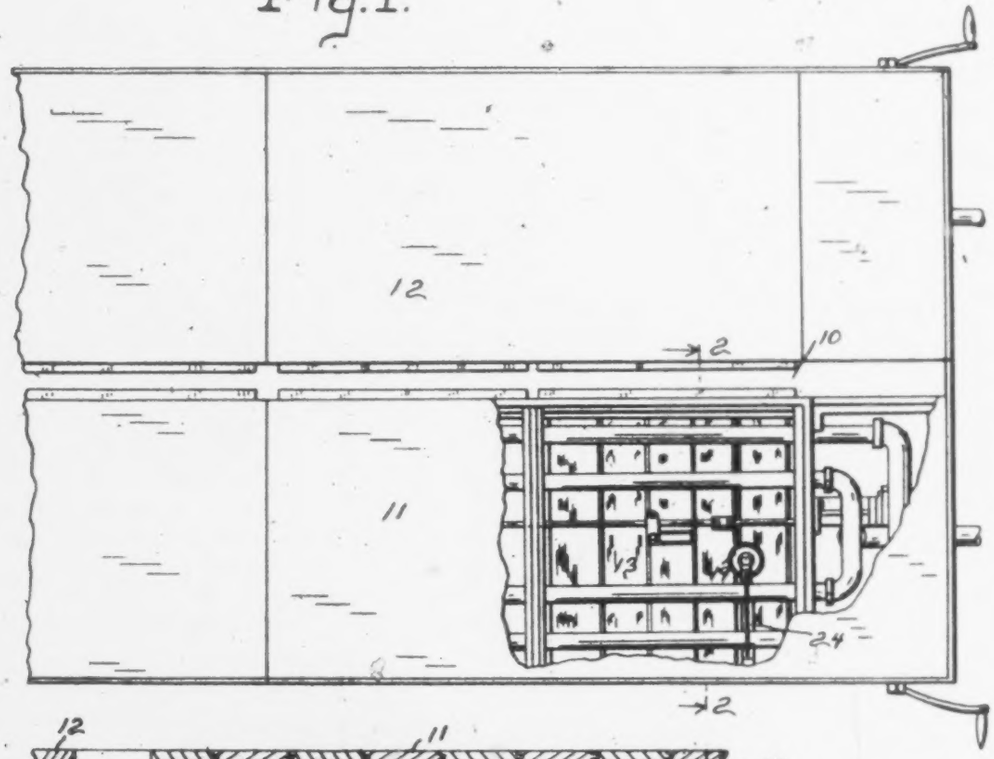
JAMES L. NIX.

March 18, 1930. G. T. MARKEY 1,751,093

VENTILATING AND HUMIDIFYING SYSTEM

Filed Feb. 6, 1926 2 Sheets-Sheet 1

Fig. 1.



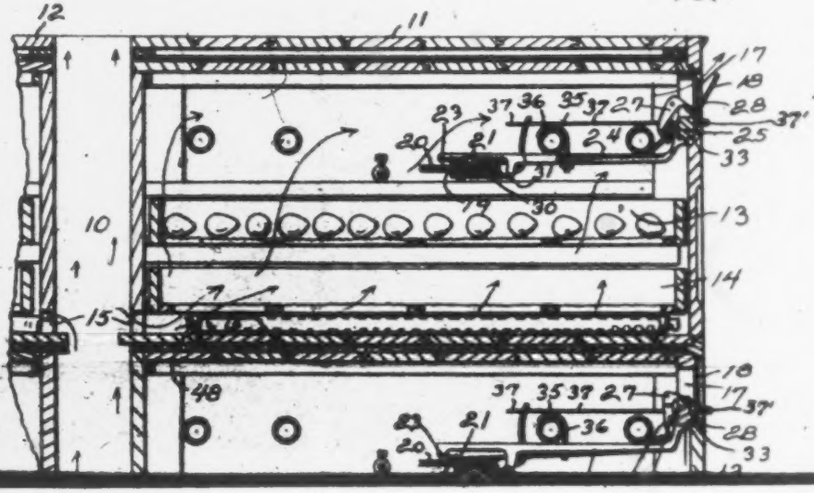
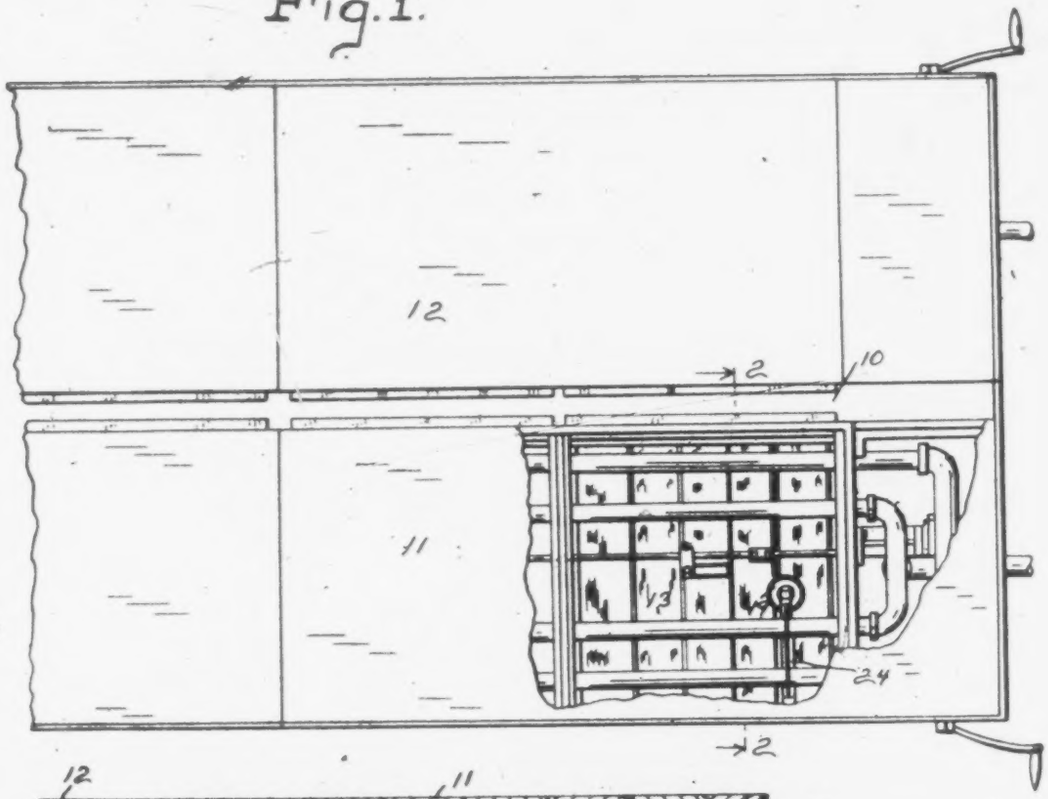


Fig. 2.

Fig. 1.



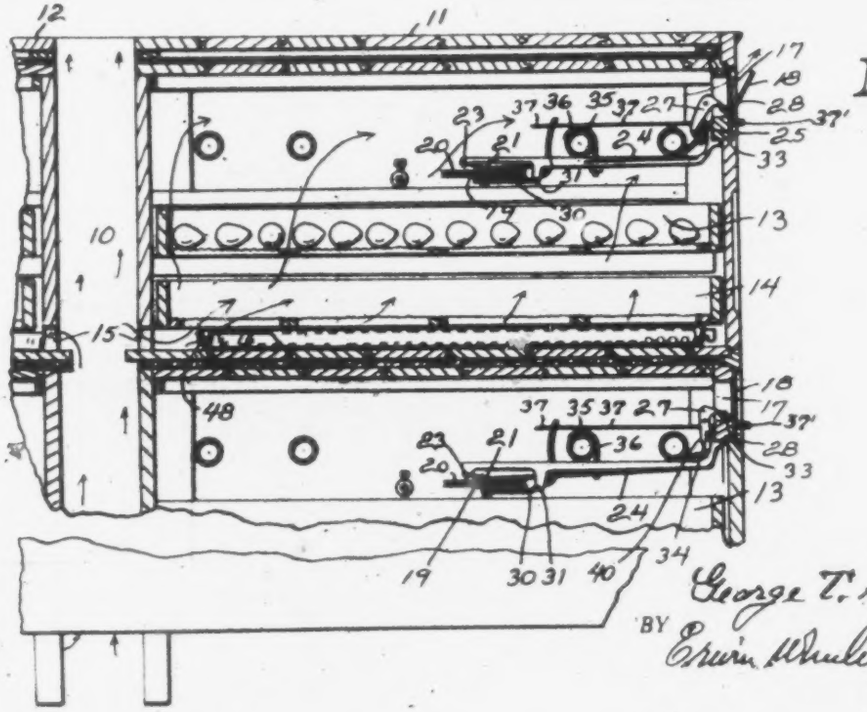


Fig. 2.

INVENTOR
George T. Harkey
BY Erwin Wheeler & Woodard
ATTORNEYS

March 18, 1930. G. T. MARKEY 1,751,093

VENTILATING AND HUMIDIFYING SYSTEM

Filed Feb. 6, 1926 2 Sheets-Sheet 2

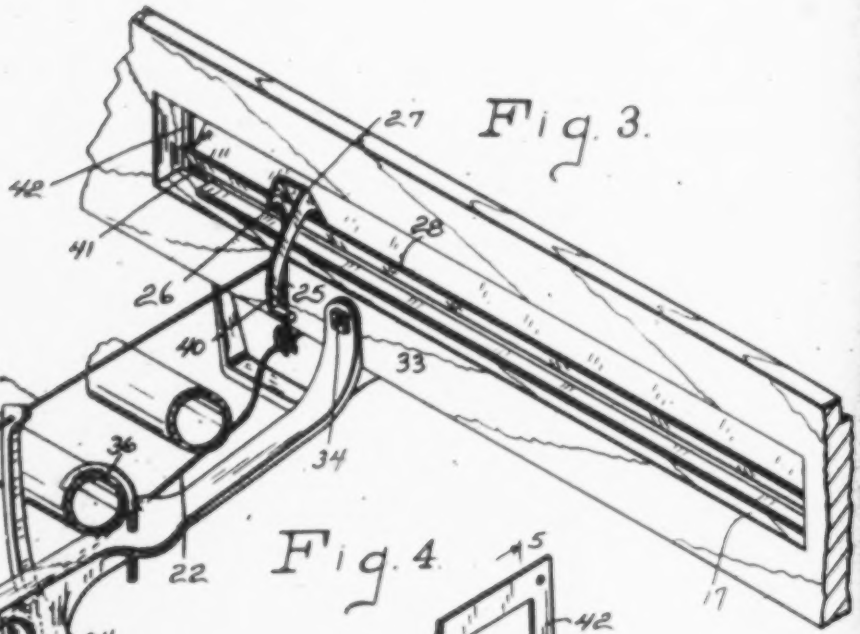


Fig. 3.

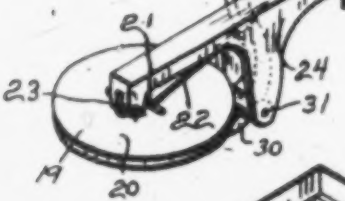


Fig. 4.

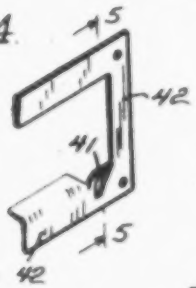


Fig. 5.

Fig. 6.

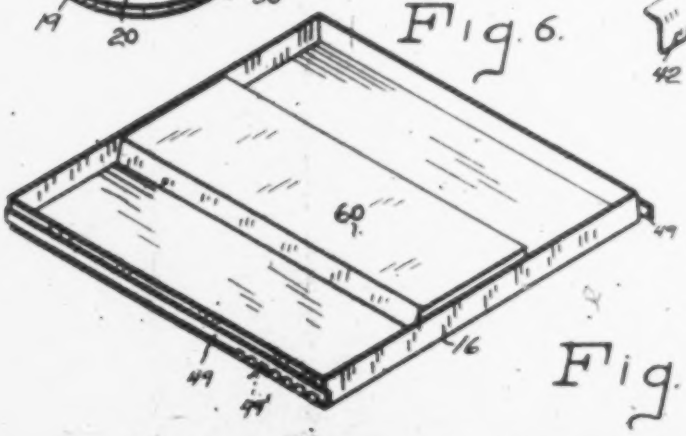
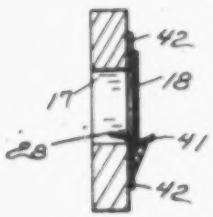
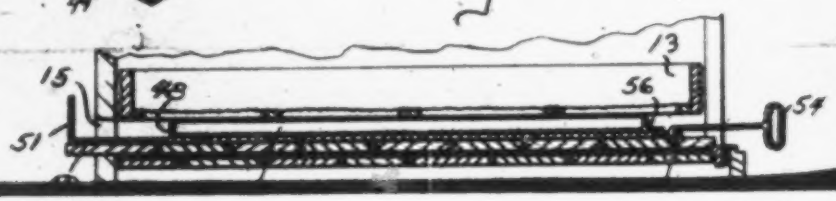


Fig. 7.





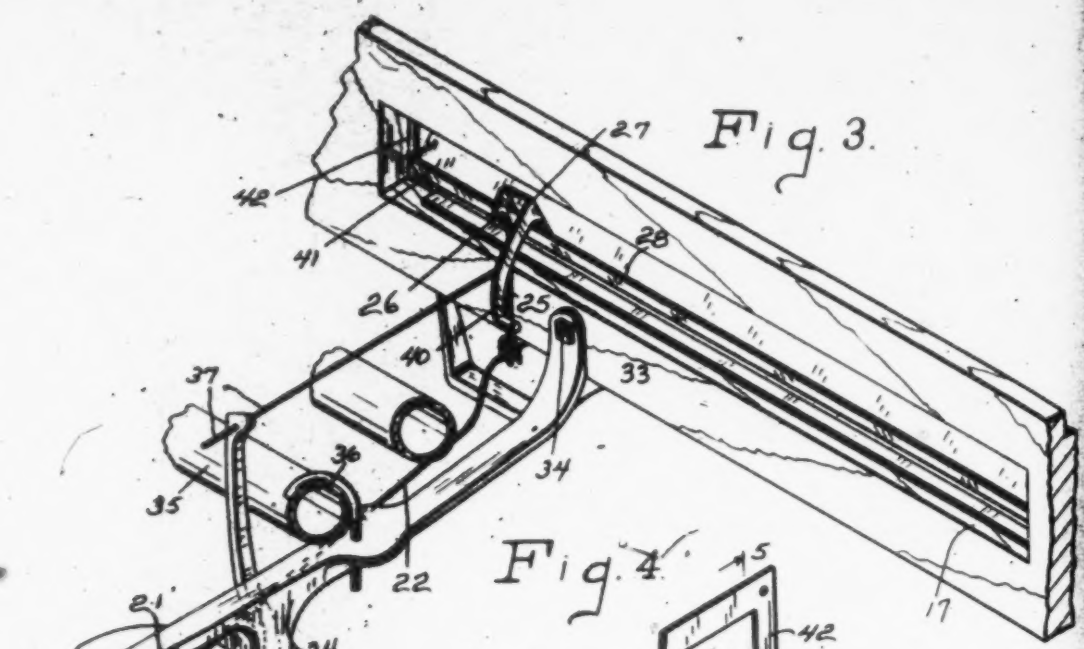


Fig. 3.

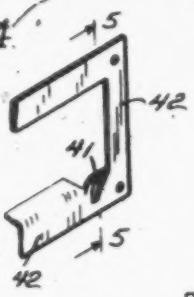


Fig. 4.

Fig. 5.

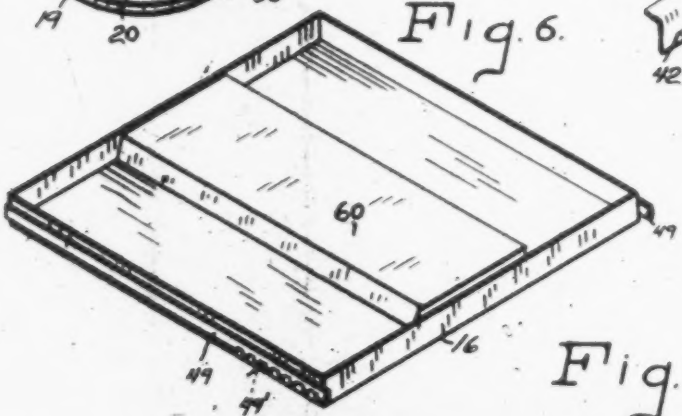


Fig. 6.

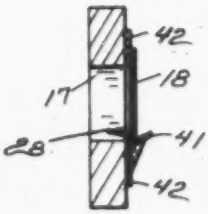
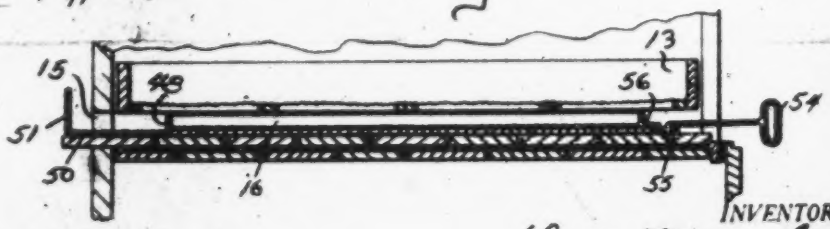


Fig. 7.



INVENTOR.
George T. Markey
BY Evans Wheeler & Woodard
ATTORNEYS.

Patented Mar. 18, 1930 1,751,093

UNITED STATES PATENT OFFICE

GEORGE T. MARKEY, OF FORT ATKINSON, WISCONSIN, ASSIGNOR TO JAMES MANUFACTURING COMPANY, OF FORT ATKINSON, WISCONSIN

VENTILATING AND HUMIDIFYING SYSTEM

Application filed February 6, 1926. Serial No. 86,483.

This invention relates to improvements in ventilating and humidifying systems for incubators, particularly for multiple compartment incubators, commonly designated as mammoth incubators.

Objects of this invention are:—to provide means for adequately controlling the passage of air through the individual compartments; to provide means for assuring an adequate distribution of air throughout each compartment; to provide delicate thermostatically controlled dampers for the respective compartments; to provide simple and effective means for humidifying the air and varying the degree of humidity by varying the area of exposure of the water to the air for absorption, and in general to provide means whereby an incubator may be adequately ventilated, properly humidified, and the ventilation system utilized in part for temperature control within a narrow range of possible variation.

In the drawings:

Figure 1 is a plan view of one end portion of my improved incubator, with parts broken away.

Figure 2 is a sectional view, drawn on line 2—2 of Figure 1, showing superposed compartments, the lower one being partially illustrated in front elevation.

Figure 3 is an isometric view of one of the thermostats and its supports, together with an associated outlet damper in the front wall of the incubator, a fragment of which is shown.

Figure 4 is a detail view of one end portion of the damper frame.

[illegible] of the same on

In the type of incubator illustrated in the drawings, one or more tiers of superposed egg receiving compartments are arranged end to end in association with an air passage 10 extending along the rear wall of the compartment of each tier. In the construction as illustrated in Figure 1, the compartments 11 and 12 are arranged with their backs opposing and spaced apart to form the air passage 10.

The number of compartments vertically superposed in each tier and the number in lineal alignments may be varied to increase or decrease the capacity of the incubator by increasing or decreasing the number of compartments, and in a companion application bearing even date herewith Serial No. 86,483, filed February 6, 1926, means are illustrated for expanding the elements of the heating system to suit the requirements of such variations in capacity. The structural features of the egg trays 13 are not essential to the invention herein claimed. The egg trays may be of any ordinary construction, except as hereinafter specified, and further description of such egg trays in this application is, therefore, unnecessary, except to say that the egg trays 13 and the nursery trays 14 have foraminous bottoms which permit air circulation therethrough and promote distribution of the air currents.

Air from the passage or flue 10 is permitted to enter each compartment through a horizontal slot 15 in its rear wall, whence it passes over a humidifying pan 16 and upwardly through the nursery tray and egg tray to the upper portion of the compartment, and thence outwardly through a slot 17 in the front wall

GEORGE T. MARKEY, OF FORT ATKINSON, WISCONSIN, ASSIGNOR TO JAMES MANUFACTURING COMPANY, OF FORT ATKINSON, WISCONSIN

VENTILATING AND HUMIDIFYING SYSTEM

Application filed February 6, 1926. Serial No. 86,482.

This invention relates to improvements in ventilating and humidifying systems for incubators, particularly for multiple compartment incubators, commonly designated as mammoth incubators.

Objects of this invention are:—to provide means for adequately controlling the passage of air through the individual compartments; to provide means for assuring an adequate distribution of air throughout each compartment; to provide delicate thermostatically controlled dampers for the respective compartments; to provide simple and effective means for humidifying the air and varying the degree of humidity by varying the area of exposure of the water to the air for absorption, and in general to provide means whereby an incubator may be adequately ventilated, properly humidified, and the ventilation system utilized in part for temperature control within a narrow range of possible variation.

In the drawings:

Figure 1 is a plan view of one end portion of my improved incubator, with parts broken away.

Figure 2 is a sectional view, drawn on line 2—2 of Figure 1, showing superposed compartments, the lower one being partially illustrated in front elevation.

Figure 3 is an isometric view of one of the thermostats and its supports, together with an associated outlet damper in the front wall of the incubator, a fragment of which is shown.

Figure 4 is a detail view of one end portion of the damper frame.

Figure 5 is a sectional view of the same on line 5—5 of Figure 4 showing also the frame in section.

Figure 6 is a detail isometric view of the improved humidifying pan.

Figure 7 is a fragmentary sectional view of one of the humidifying pans and associated parts, illustrating the means drawn to the same plane as Figure 2 and illustrating the use of said pan as part of the circulation controlling means.

Like parts are identified by the same reference characters throughout the several views.

In the type of incubator illustrated in the drawings, one or more tiers of superposed egg receiving compartments are arranged end to end in association with an air passage 10 extending along the rear wall of the compartment of each tier. In the construction as illustrated in Figure 1, the compartments 11 and 12 are arranged with their backs opposing and spaced apart to form the air passage 10.

The number of compartments vertically superposed in each tier and the number in lineal alignments may be varied to increase or decrease the capacity of the incubator by increasing or decreasing the number of compartments, and in a companion application bearing even date herewith Serial No. 86,483, filed February 6, 1926, means are illustrated for expanding the elements of the heating system to suit the requirements of such variations in capacity. The structural features of the egg trays 13 are not essential to the invention herein claimed. The egg trays may be of any ordinary construction, except as hereinafter specified, and further description of such egg trays in this application is, therefore, unnecessary, except to say that the egg trays 13 and the nursery trays 14 have foraminous bottoms which permit air circulation therethrough and promote distribution of the air currents.

Air from the passage or flue 10 is permitted to enter each compartment through a horizontal slot 15 in its rear wall, whence it passes over a humidifying pan 16 and upwardly through the nursery tray and egg tray to the upper portion of the compartment, and thence outwardly through a slot 17 in the front wall to the exterior. The flow of air through the outlet slot 17 is controlled by a damper 18, the position of which is determined by a thermostat 19 having a movable wall 20 connected at 21 with a lever 22 pivoted at 23 to a supporting arm 24. The lever 22 has its long arm connected by a link 25 with a rocker pin 26 journaled in a bracket 27, which is secured to a flange 28 projecting inwardly from the damper 18. The thermostat 19 is adjustably supported at a short distance above the eggs and near the center of the compartment

by a lever 30, fulcrumed at 31 to depending ears carried by a bar 32, said bar being secured to a frame member 33 by a bolt 34, and being suspended at an intermediate point from one of the heating pipes 35 by a hook-shaped hanger 36. The supporting lever 30 of the thermostat has an upwardly projecting arm through which a screw threaded adjusting rod 37 extends as illustrated in Figure 3. This adjusting rod 37 extends to the exterior and is provided with a projecting end member 37′ whereby it may be rotated to swing the lever upon its fulcrum 31 to adjust the thermostat in its proper position.

The arrangement is such that as the temperature rises, the movable top wall or diaphragm of the thermostat is lifted by expansion of its contained fluid and being connected with the lever 22 in close proximity to its fulcrum 23, the movement is multiplied in the long arm of the lever and link 25 in such a manner that the damper will be opened or closed to the required extent in correspondence with the movement of the diaphragm 20 as the temperature within the chamber rises or falls.

The damper 18 is preferably formed of thin sheet metal, suitably embossed or ribbed to provide adequate strength with minimum weight of material, it being important to reduce the inertia to a minimum. The inwardly projecting flange and associated bracket tend to counter-balance the weight of the damper wing 18, and a weighted arm 40 on the bracket 27 tends to cause the damper to close by gravity. The ends of the damper wing 18 are extended beyond the flange 28 and are loosely supported within the angles formed by outwardly turned lips 41 on a sheet metal frame 42 secured to the exterior surface of the compartment wall along the margins of the outlet slot.

Inasmuch as one of these dampers must be provided for each compartment and operated under light pressure under conditions which require extreme sensitiveness, the importance of these features from the standpoint of efficiency and minimum cost of construction will be readily appreciated.

The admission of air from the rear side of the compartment, or from the passageway or flue 10 [illegible] such a flue is provided, is also preferably controlled,—not only in accordance with the requirements in each stage within the compartment. The moisture [illegible] is of less width (front to rear) than the [illegible] compartment and by adjusting the moisture [illegible] inwardly in the direction of the inlet 15 the inlet port may be substantially closed or fully opened as desired, said rear wall of the moisture pan 48 serving as a damper for the reason that when this rear wall of the moisture pan is directly underneath the rear wall of the nursery tray the admission of air will be substantially cut off. By moving the moisture pan forwardly to the position in which it is shown in Figure 7 air is permitted to pass upwardly through the foraminous bottom, said bottom being located at a substantial distance above the bottom of the nursery tray. It is locked by latch bar 49 engaging lug 49′.

In addition to the use of the moisture pan for regulating the admission of air to the compartment, I find it desirable to employ a slide 50 having an up-turned flange 51 within the passage 10, whereby the air entering the compartment is required to pass downwardly between the flange 51 and the rear wall of the compartment in order to reach the slot 15. The slide 50 may be moved forwardly or backwardly to increase or reduce the size of this passage, according to the position of the compartment in relation to the other compartments of the series and to counteract the tendency due to the location of any compartment in the series to permit an increased or decreased velocity of the circulating currents through the inlet. The adjustment of the flange 51 may be permanent after an incubator has once been installed and tested, but the adjustment of the moisture pan to additionally control the flow of air will be made from time to time in accordance with the internal conditions and the stage of incubation within any given compartment.

The moisture pan may be conveniently adjusted by means of the hook-shaped member 54 illustrated in Figure 7 where it is shown as engaging a projection 55 from the [illegible] margins of the slide 50. The same hook [illegible] be employed to engage a projection 56 [illegible] pan 16.

The capacity of the moisture pan [illegible] humidifying the air in the compartment [illegible] also be regulated in part by the adjustment of the pan as above described, but [illegible]

justing rod 37 extends as illustrated in Figure 3. This adjusting rod 37 extends to the exterior and is provided with a projecting end member 37′ whereby it may be rotated to swing the lever upon its fulcrum 31 to adjust the thermostat in its proper position.

The arrangement is such that as the temperature rises, the movable top wall or diaphragm of the thermostat is lifted by expansion of its contained fluid and being connected with the lever 22 in close proximity to its fulcrum 23, the movement is multiplied in the long arm of the lever and link 25 in such a manner that the damper will be opened or closed to the required extent in correspondence with the movement of the diaphragm 20 as the temperature within the chamber rises or falls.

The damper 18 is preferably formed of thin sheet metal, suitably embossed or ribbed to provide adequate strength with minimum weight of material, it being important to reduce the inertia to a minimum. The inwardly projecting flange and associated bracket tend to counter-balance the weight of the damper wing 18, and a weighted arm 40 on the bracket 27 tends to cause the damper to close by gravity. The ends of the damper wing 18 are extended beyond the flange 28 and are loosely supported within the angles formed by outwardly turned lips 41 on a sheet metal frame 42 secured to the exterior surface of the compartment wall along the margins of the outlet slot.

Inasmuch as one of these dampers must be provided for each compartment and operated under light pressure under conditions which require extreme sensitiveness, the importance of these features from the standpoint of efficiency and minimum cost of construction will be readily appreciated.

The admission of air from the rear side of the compartment, or from the passageway or flue 10 where such a flue is provided, is also preferably controlled,—not only in accordance with the requirements in each stage of incubation, but also for the purpose of counteracting the tendency of the air in the flue 10 to develop currents through one compartment at the expense of another. To accomplish this, the inlet slots 15 of the several compartments are made of substantially the same height as the rear wall 48 of the moisture pan 16. The bottom of the nursery tray is immediately above the moisture pan, with just sufficient clearance to allow the moisture pan to be moved forwardly or backwardly is directly underneath the rear wall of the nursery tray the admission of air will be substantially cut off. By moving the moisture pan forwardly to the position in which it is shown in Figure 7 air is permitted to pass upwardly through the foraminous bottom, said bottom being located at a substantial distance above the bottom of the nursery tray. It is locked by latch bar 49 engaging lug 49′.

In addition to the use of the moisture pan for regulating the admission of air to the compartment, I find it desirable to employ a slide 50 having an up-turned flange 51 within the passage 10, whereby the air entering the compartment is required to pass downwardly between the flange 51 and the rear wall of the compartment in order to reach the slot 15. The slide 50 may be moved forwardly or backwardly to increase or reduce the size of this passage, according to the position of the compartment in relation to the other compartments of the series and to counteract the tendency due to the location of any compartment in the series to permit an increased or decreased velocity of the circulating currents through the inlet. The adjustment of the flange 51 may be permanent after an incubator has once been installed and tested, but the adjustment of the moisture pan to additionally control the flow of air will be made from time to time in accordance with the internal conditions and the stage of incubation within any given compartment.

The moisture pan may be conveniently adjusted by means of the hook-shaped member 54 illustrated in Figure 7 where it is shown as engaging a projection 55 from the front margins of the slide 50. The same hook may be employed to engage a projection 56 on the pan 16.

The capacity of the moisture pan 16 for humidifying the air in the compartment may also be regulated in part by the adjustment of the pan as above described, but in larger part by employing an invertible pan 60 therein, which is approximately one-third of the capacity of the pan 16. When the pan 60 is inverted within the pan 16, as shown in Figure 6, only two-thirds of the water in the pan will be exposed to the air for moisture absorption. If the pan 60 is right side up and both pans filled with water, the full capacity of the pan 16, without the pan 60, will be realized. But, if only pan 60 is filled with water, the exposure for moisture absorption will, of

course, be only one-third of the maximum capacity of the pan 16.

Therefore, by utilizing the auxiliary pan 60 in connection with adjustments of the pan 16 toward or away from the air inlet slot 15, adequate regulation of the moisture contained within the compartment is obtained without such interference with the ventilating currents as would be required in the absence of the auxiliary pan 60.

From the foregoing description, it will be apparent that preliminary control of the ventilation in each compartment may be obtained manually by adjustment of the slide 50 and of the moisture pan 16. Subsequently, an automatic control is obtained by thermostatically adjusting the damper 18. The inlet and outlet slots have a length nearly as great as the horizontal dimensions of the front and rear walls of the compartment and the air entering through the inlet slot 15 will be distributed in part by the foraminous bottom of the nursery tray 14 and in part by the similarly formed bottom of the egg tray and by the eggs. The tendency of the air to form a vertically ascending column is thus counteracted in part, and additionally counteracted by locating the outlet on the opposite side of the chamber. The location of the thermostat is also important, both as to its position in the central portion of the compartment and as to its position immediately above the eggs, whereby the damper 18 may be controlled in strict accordance with the temperature of the air surrounding the eggs. Proper conditions of ventilation and humidity are, therefore, obtainable, not only throughout a single compartment, but throughout a series of compartments connected with a common air supply flue, regardless of whether the compartments are superposed or lineally aligned. It is, of course, not material to the invention herein claimed whether the air is circulated by gravity or under forced draft.

It will also be obvious that while I have described the flue 10 as a part of the incubator, this is not an essential feature except in cases where incubator chambers are arranged back to back. In such cases the opposed chambers are separated to allow air to enter through the rear walls and this forms the flue 10. [illegible] arranged in a single

of an opposing wall, said slots being of a length substantially equal to the length of the chamber, means for manually controlling the passage of air through one of the slots by varying its width and means for thermostatically controlling the passage of air through the other, whereby the capacity of the inlet slot may be proportioned to the normal requirements for delivery of air through the outlet, said compartment having an egg tray at an intermediate point adapted to promote distribution of the air current throughout the portion of the compartment occupied by said tray by partially obstructing the flow of air at all points in the space occupied by the tray.

2. In an incubator compartment, a moisture pan, a nursery tray having a foraminous bottom and located above the moisture pan, and an egg tray above the nursery tray, said compartment having an air inlet aperture in one wall communicating with the space below the nursery tray substantially along its entire length and also having an air outlet aperture in the opposing wall communicating with the exterior from the space above the egg tray, a valve controlling the flow of air through the outlet, a baffle, spaced from the rear wall and forming a downwardly extending normally constantly open passage leading to the inlet aperture, means for manually varying the capacity of said inlet aperture, and a thermostat within the space above the egg tray, operatively connected to said valve.

3. In an incubator compartment, a moisture pan, a nursery tray having a foraminous bottom and located above the moisture pan, and an egg tray above the nursery tray, said compartment having an air inlet aperture in one wall communicating with the space below the nursery tray substantially along its entire length and also having an air outlet aperture in the opposing wall communicating with the exterior from the space above the egg tray, the space within the compartment at and above the level of the outlet being wholly unobstructed in all directions from the aperture in said wall to each of the other walls of the compartment, said aperture also having a length substantially equal to that of the compartment, a valve controlling the flow of air through the outlet, and a thermostat within

ments as would be required in the absence of the auxiliary pan 60.

From the foregoing description, it will be apparent that preliminary control of the ventilation in each compartment may be obtained manually by adjustment of the slide 50 and of the moisture pan 16. Subsequently, an automatic control is obtained by thermostatically adjusting the damper 18. The inlet and outlet slots have a length nearly as great as the horizontal dimensions of the front and rear walls of the compartment and the air entering through the inlet slot 15 will be distributed in part by the foraminous bottom of the nursery tray 14 and in part by the similarly formed bottom of the egg tray and by the eggs. The tendency of the air to form a vertically ascending column is thus counteracted in part, and additionally counteracted by locating the outlet on the opposite side of the chamber. The location of the thermostat is also important, both as to its position in the central portion of the compartment and as to its position immediately above the eggs, whereby the damper 18 may be controlled in strict accordance with the temperature of the air surrounding the eggs. Proper conditions of ventilation and humidity are, therefore, obtainable, not only throughout a single compartment, but throughout a series of compartments connected with a common air supply flue, regardless of whether the compartments are superposed or lineally aligned. It is, of course, not material to the invention herein claimed whether the air is circulated by gravity or under forced draft.

It will also be obvious that while I have described the flue 10 as a part of the incubator, this is not an essential feature except in cases where incubator chambers are arranged back to back. In such cases the opposed chambers are separated to allow air to enter through their rear walls and this forms the flue 10. Where the incubators are arranged in a single lineal series, the flue 10 is not essential, but it will be found desirable in such cases to set the incubator with its back near a wall of the room which is thus made to co-operate in forming a flue or quiet space free from drafts when doors or windows are opened.

I claim:

1. In a ventilating system for incubators, an egg compartment having a horizontal slot in the lower portion of one wall, said slot and the chamber space being adapted to allow air to enter in a horizontally flowing sheet and another horizontal slot in the upper portion the outlet, said compartment having an egg tray at an intermediate point adapted to promote distribution of the air current throughout the portion of the compartment occupied by said tray by partially obstructing the flow of air at all points in the space occupied by the tray.

2. In an incubator compartment, a moisture pan, a nursery tray having a foraminous bottom and located above the moisture pan, and an egg tray above the nursery tray, said compartment having an air inlet aperture in one wall communicating with the space below the nursery tray substantially along its entire length and also having an air outlet aperture in the opposing wall communicating with the exterior from the space above the egg tray, a valve controlling the flow of air through the outlet, a baffle, spaced from the rear wall and forming a downwardly extending normally constantly open passage leading to the inlet aperture, means for manually varying the capacity of said inlet aperture, and a thermostat within the space above the egg tray, operatively connected to said valve.

3. In an incubator compartment, a moisture pan, a nursery tray having a foraminous bottom and located above the moisture pan, and an egg tray above the nursery tray, said compartment having an air inlet aperture in one wall communicating with the space below the nursery tray substantially along its entire length and also having an air outlet aperture in the opposing wall communicating with the exterior from the space above the egg tray, the space within the compartment at and above the level of the outlet being wholly unobstructed in all directions from the aperture in said wall to each of the other walls of the compartment, said aperture also having a length substantially equal to that of the compartment, a valve controlling the flow of air through the outlet, and a thermostat within the space above the egg tray operatively connected to said valve, and manually operable means for also controlling the admission of air through said inlet aperture without varying its length.

4. In a ventilating system for incubators, a series of egg compartments each having a horizontally disposed air inlet slot in the lower portion of one wall substantially throughout its length and another horizontally disposed air outlet slot in the upper portion of the opposing wall, intervening nursery and egg trays each adapted to permit a distribu-

tion of air therethrough and to require such distribution in passing through the compartment, a set of walls forming an air passage communicating in common with the inlet slots, manually operable means for separately regulating air delivery to the individual compartments at the inlet slots without varying their length, and means for thermostatically regulating the flow of air through the outlet slots, the space within each compartment at and above the level of its outlet slot being wholly unobstructed in all directions and the thermostatic regulating means including a thermostat located at a substantial distance below said level and in close proximity to the egg tray.

5. In a ventilating system for incubators, a series of egg compartments having air inlet openings, an air supply chamber communicating in common with the several egg compartments through said air inlet openings, and adjustable slides extending through said openings and provided with upwardly extending walls in the air chamber whereby the flow of air in the several compartments may be separately controlled and the air directed downwardly and inwardly to the respective compartments by said slides and their upturned flanges.

6. In an incubator compartment having an air inlet opening in the lower portion of one wall and a narrow outlet opening in the upper portion of an opposing wall, the combination with the walls of said compartment, of an adjustable slide provided with an upturned valve, movable toward and away from the air inlet opening to regulate the flow of air therethrough, a moisture pan in the bottom portion of the compartment in a position to allow the entering air to flow thereover, a nursery tray located above the moisture pan and provided with openings adapted to allow the passage of air therethrough and to facilitate its distribution throughout the area of the compartment, and an egg tray located above the nursery tray and also adapted to permit the passage of air therethrough to the air outlet.

7. In an incubator compartment, having an air inlet opening in the lower portion of one wall and a narrow outlet opening in the upper portion of an opposing wall, the combination with the walls of said compartment, walls at the respective ends of its lower margin, a thermostat supported above the central portion of the egg tray and connections between the thermostat and said tilting valve for adjusting the valve.

8. In an incubator having an egg compartment provided with air inlet and outlet openings and intermediate egg supporting means, the combination with the walls of said compartment, of a frame for the air outlet opening provided with obliquely disposed projecting ears, a thin sheet metal valve having its lower margin loosely pivoted between said ears and the body portion of the frame, and a thermostat supported in proximity to the central portion of the egg tray and operatively connected with said valve.

9. In an incubator having an egg compartment provided with an air inlet and outlet openings and an intermediate egg supporting means and heating pipe connections, the combination with the walls of said compartment, of a frame for the air outlet opening provided with obliquely disposed projecting ears, a thin sheet metal valve having its lower margin loosely pivoted between said ears and the body portion of the frame, and a thermostat supported in proximity to the central portion of the egg tray and operatively connected with said valve having a sustaining connection with one of the heating pipes and one of the walls of the compartment; said heating pipes, egg supporting means and thermostat being located below the level of the outlet opening and the space at and above the level of the outlet opening being wholly unobstructed from the opening in all directions within said chamber.

GEORGE T. MARKEY.

dividual compartments at the inlet slots without varying their length, and means for thermostatically regulating the flow of air through the outlet slots, the space within each compartment at and above the level of its outlet slot being wholly unobstructed in all directions and the thermostatic regulating means including a thermostat located at a substantial distance below said level and in close proximity to the egg tray.

5. In a ventilating system for incubators, a series of egg compartments having air inlet openings, an air supply chamber communicating in common with the several egg compartments through said air inlet openings, and adjustable slides extending through said openings and provided with upwardly extending walls in the air chamber whereby the flow of air in the several compartments may be separately controlled and the air directed downwardly and inwardly to the respective compartments by said slides and their upturned flanges.

6. In an incubator compartment having an air inlet opening in the lower portion of one wall and a narrow outlet opening in the upper portion of an opposing wall, the combination with the walls of said compartment, of an adjustable slide provided with an upturned valve, movable toward and away from the air inlet opening to regulate the flow of air therethrough, a moisture pan in the bottom portion of the compartment in a position to allow the entering air to flow thereover, a nursery tray located above the moisture pan and provided with openings adapted to allow the passage of air therethrough and to facilitate its distribution throughout the area of the compartment, and an egg tray located above the nursery tray and also adapted to permit the passage of air therethrough to the air outlet.

7. In an incubator compartment, having an air inlet opening in the lower portion of one wall and a narrow outlet opening in the upper portion of an opposing wall, the combination with the walls of said compartment, of a moisture pan adjustable toward and away from the air inlet opening to regulate the flow of air therethrough, a nursery tray located above the moisture pan and provided with openings adapted to allow the passage of air therethrough and to facilitate its distribution throughout the area of the compartment, and an egg tray located above the nursery tray and also adapted to permit the passage of air therethrough to the air outlet, said air outlet being provided with a valve pivotally connected with the compartment

ment provided with an inlet and outlet openings and intermediate egg supporting means, the combination with the walls of said compartment, of a frame for the air outlet opening provided with obliquely disposed projecting ears, a thin sheet metal valve having its lower margin loosely pivoted between said ears and the body portion of the frame, and a thermostat supported in proximity to the central portion of the egg tray and operatively connected with said valve.

9. In an incubator having an egg compartment provided with an air inlet and outlet openings and an intermediate egg supporting means and heating pipe connections, the combination with the walls of said compartment, of a frame for the air outlet opening provided with obliquely disposed projecting ears, a thin sheet metal valve having its lower margin loosely pivoted between said ears and the body portion of the frame, and a thermostat supported in proximity to the central portion of the egg tray and operatively connected with said valve having a sustaining connection with one of the heating pipes and one of the walls of the compartment; said heating pipes, egg supporting means and thermostat being located below the level of the outlet opening and the space at and above the level of the outlet opening being wholly unobstructed from the opening in all directions within said chamber.

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March 17, 1931. G. T. MARKEY 1,796,872

EGG TRAY AND EGG TILTING MECHANISM

Filed July 9, 1928 2 Sheets-Sheet 1

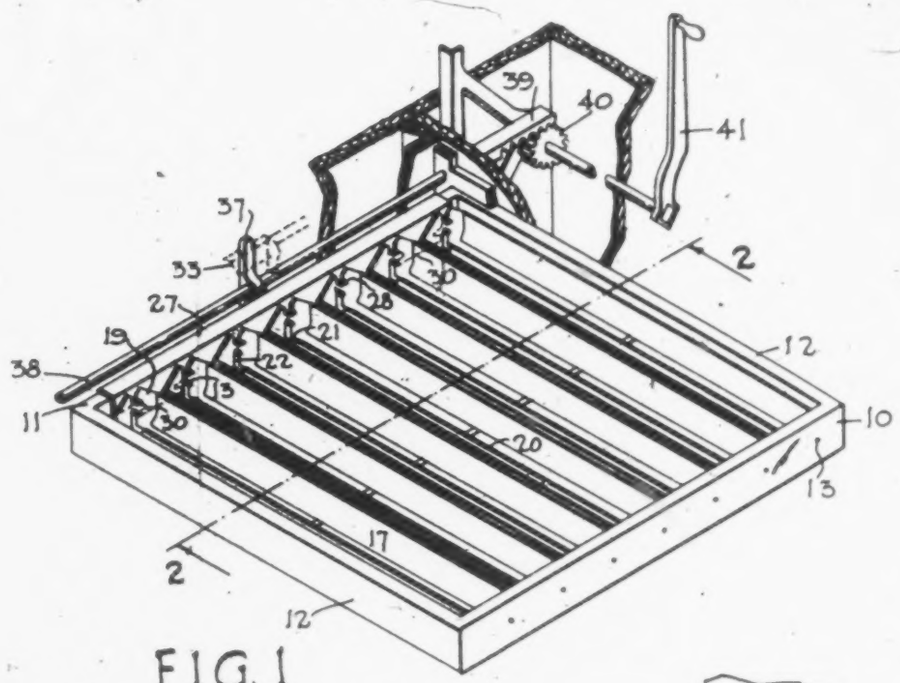


FIG. 1

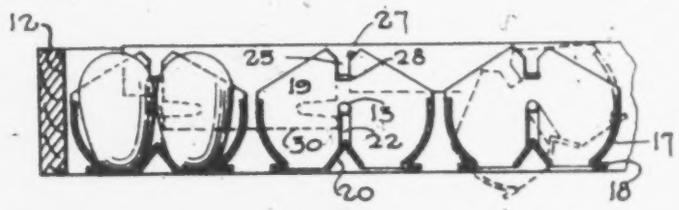
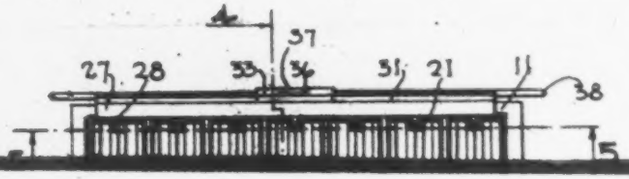


FIG. 2



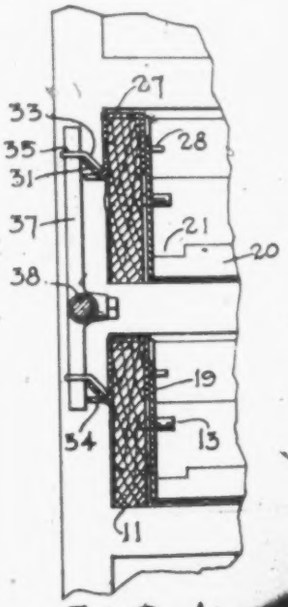


FIG. 4

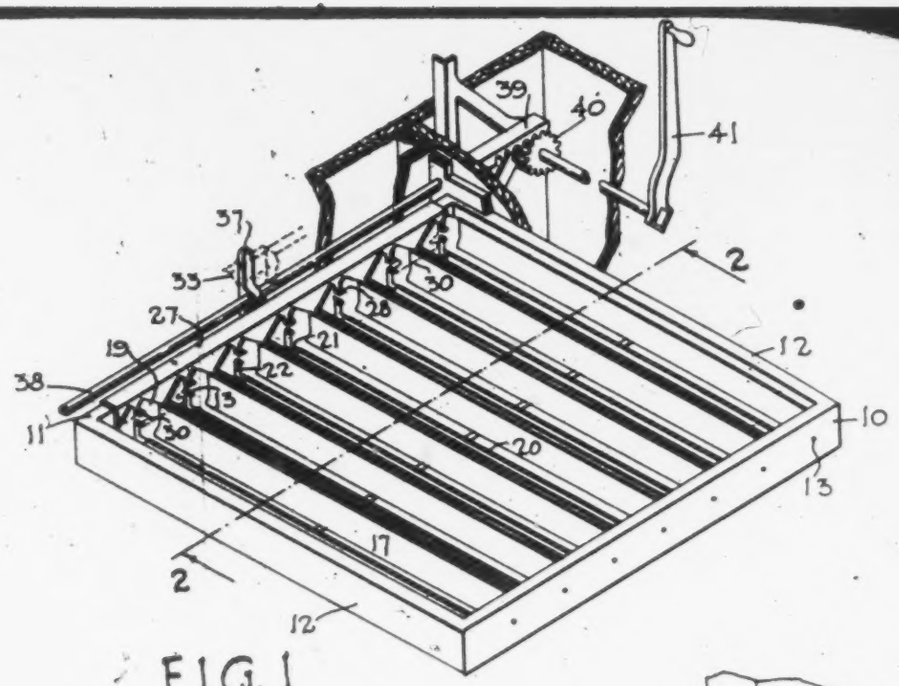


FIG. 1

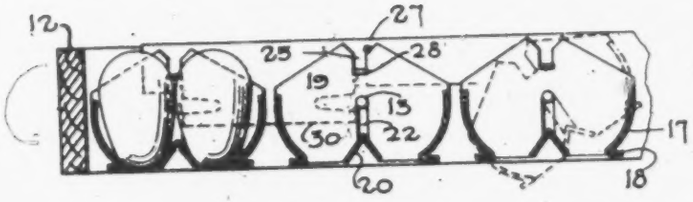


FIG. 2

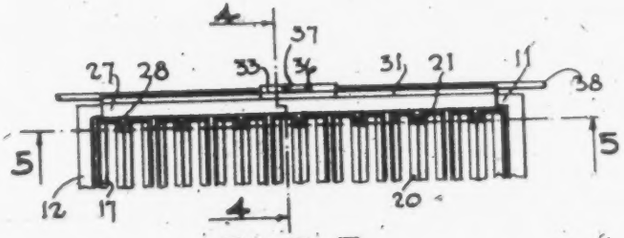


FIG. 3

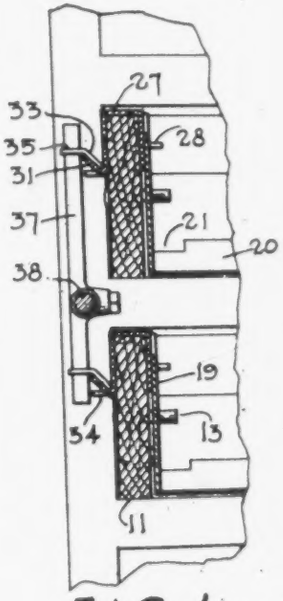


FIG. 4

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March 17, 1931. G. T. MARKEY 1,796,872

EGG TRAY AND EGG TILTING MECHANISM

Filed July 9, 1928 2 Sheets-Sheet 2

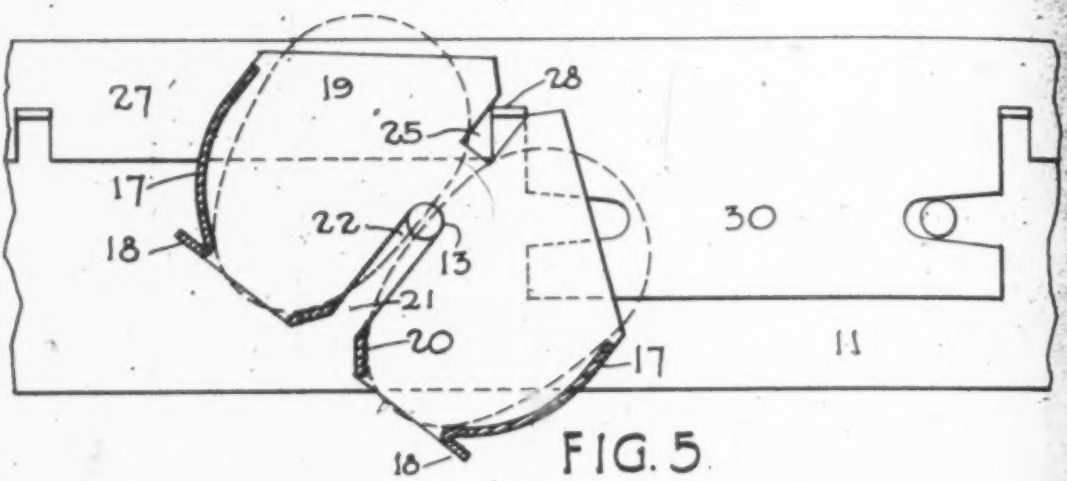


FIG. 5

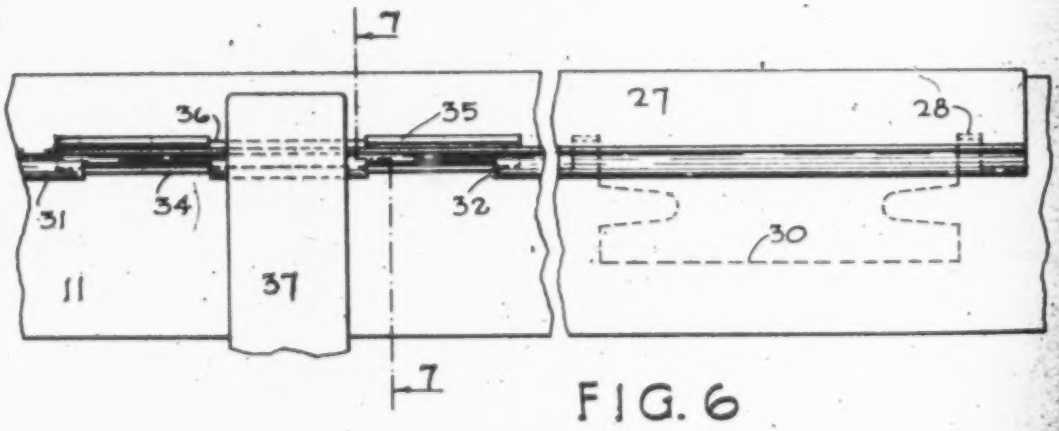
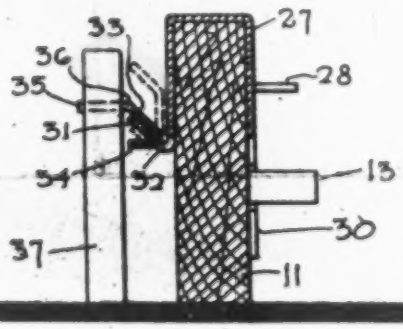


FIG. 6



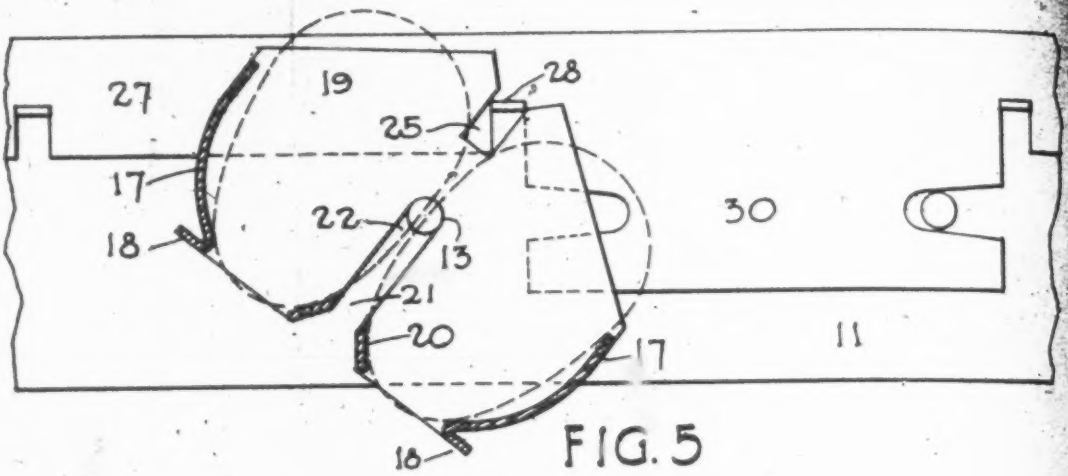


FIG. 5

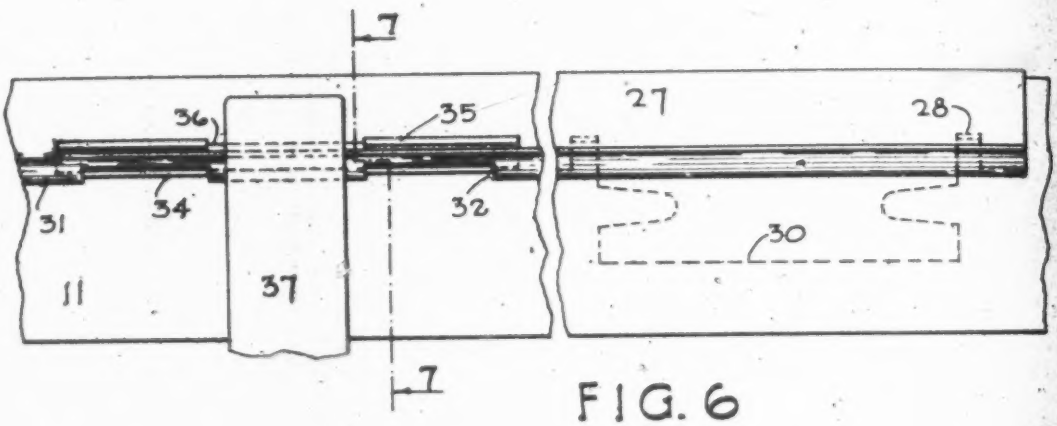


FIG. 6

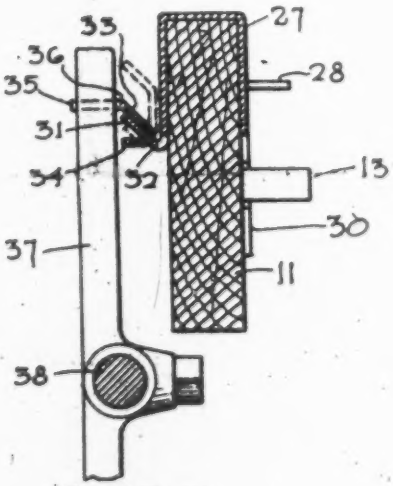


FIG. 7

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Patented Mar. 17, 1931 1,796,872

UNITED STATES PATENT OFFICE

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EGG TRAY AND EGG-TILTING MECHANISM

Application filed July 9, 1928. Serial No. 291,288.

My invention relates to improvements in incubator egg holding and egg tilting devices, with particular reference to incubators of that type in which the eggs may be tilted by mechanical means operable from a point exterior to the incubator.

The primary object of this invention is to provide improved means for holding the eggs in an egg tray and tilting them uniformly at suitable intervals.

A further object is to provide improved means for supporting the egg holding cages removably from a tray frame, each cage being formed to facilitate candling operations by holding the eggs in straight rows, with each cage of a convenient size for manipulation over a source of light, and all of the eggs exposed to rays of light from a source beneath the cage; also to provide cages which may be independently removed for filling or candling purposes, and then replaced, all without material time consuming manipulation.

A still further object of my invention is to provide simple, sanitary, durable and efficient egg holding and tilting means for incubators designed to contain multiple egg trays or tray frames.

In the drawings:

Figure 1 is an isometric view of an egg tray, with associated egg holding and egg tilting mechanism embodying my invention.

Figure 2 is an enlarged fragmentary sectional view drawn generally to line 2—2 of Figure 1, with dotted lines indicating one of the egg holding cages in a tilted position.

Figure 3 is a fragmentary plan view of a [illegible] of the egg trays and associated tilting mechanism.

Figure 4 is a fragmentary sectional view drawn generally to line 4—4 of Figure 3.

Figure 5 is a fragmentary sectional view drawn generally to line 5—5 of Figure 3.

Figure 6 is a fragmentary sectional view drawn generally to line 6—6 of Figure 3.

Figure

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EGG TRAY AND EGG-TILTING MECHANISM

Application filed July 9, 1928. Serial No. 291,280.

My invention relates to improvements in incubator egg holding and egg tilting devices, with particular reference to incubators of that type in which the eggs may be tilted by mechanical means operable from a point exterior to the incubator.

The primary object of this invention is to provide improved means for holding the eggs in an egg tray and tilting them uniformly at suitable intervals.

A further object is to provide improved means for supporting the egg holding cages removably from a tray frame, each cage being formed to facilitate candling operations by holding the eggs in straight rows, with each cage of a convenient size for manipulation over a source of light, and all of the eggs exposed to rays of light from a source beneath the cage; also to provide cages which may be independently removed for filling or candling purposes, and then replaced, all without material time consuming manipulation.

A still further object of my invention is to provide simple, sanitary, durable and efficient egg holding and tilting means for incubators designed to contain multiple egg trays or tray frames.

In the drawings:

Figure 1 is an isometric view of an egg tray, with associated egg holding and egg tilting mechanism embodying my invention.

Figure 2 is an enlarged fragmentary sectional view drawn generally to line 2—2 of Figure 1, with dotted lines indicating one of the egg holding cages in a tilted position.

Figure 3 is a fragmentary plan view of a portion of one of the egg trays and associated tilting mechanism.

Figure 4 is a sectional view, drawn generally to line 4—4 of Figure 3.

Figure 5 is a sectional view, drawn to line 5—5 of Figure 3.

Figure 6 is a rear elevation of a fragment of one of the trays and associated tilting slide.

Figure 7 is a sectional view of the rear wall or member of the tray frame and associated slide, drawn to line 7—7 of Figure 6.

Like parts are identified by the same reference characters throughout the several views.

The tray frames comprise front and rear bars 10 and 11, connected by the side bars 12 to make a rectangular, preferably square, frame. Each of the bars 10 and 11 is provided with a series of inwardly projecting studs formed by inserting pins 13 through the bars at suitable intervals, the inner ends of these pins constituting the studs. The studs projecting inwardly from the front bar are axially aligned in pairs with corresponding studs projecting inwardly from the rear bar, whereby each pair of studs so axially aligned may serve as pivotal supports for an egg holding cage, which will now be described.

The egg holding cages have side walls 17 of a generally arcuate form in cross section. The lower margins of each of these walls are turned to form strengthening flanges 18. The walls 17 are otherwise concavo-convex in form, with their concave surfaces opposed or faced inwardly and pitched divergently from their lower to their upper margins, the ends of the walls being secured to the end walls 19 of the cage. The end walls are also connected along their lower margins by a centrally disposed angle bar 20, having the form of an inverted V in cross section. The side walls 17 and walls 19 and the angle bar 20 form the egg receiving cage.

The bar 20 has its ends notched or cut away at the apex of the bar as indicated at 21 in Figure 5. Each end wall 19 of the cage is provided with a slot 22 extending upwardly from its lower margin, such margin being preferably provided with a V-shaped notch corresponding with the contour of the bar 20. The slot 22 is adapted to receive one of the studs or pins 13, whereby the cage may be supported with its opposite end similarly supported by the corresponding stud of the pair.

The side wall strips 17 of the cage have their lower margins so spaced from the intermediate V-shaped bar 20 as to support rows of eggs along each side of said bar 20, each cage being thus adapted to support two rows of eggs. The eggs are loosely supported

and the cages are sufficiently open to allow air to circulate freely about the eggs. In the construction shown, seven of these egg cages are thus mounted in one tray frame parallel with each other and extending from front to rear. Each tray frame will thus contain fourteen rows of eggs. The means for tilting these cages with their contained eggs will now be described.

It will be observed that each of the end walls of the egg cages is provided with a notch 25 extending downwardly in the wall from its upper margin and substantially in line with the slot 22. A sheet metal channel-shaped slide 27 is adapted to fit over the upper margin of the tray frame and between it and the upwardly projecting marginal portions of the associated egg cages, the inner wall of the slide being provided with projections 28 positioned for entry in the notches 25 of the end walls of the cages. At intervals these slides may be provided on their inner side with guiding extensions 30, which furnish side bearings, both vertically and laterally, to prevent the slide 27 from tilting upon the upper margin of the tray frame. The ends of these projections 30 may be notched to prevent them from interfering with the movement of the slide, if one of the studs 13 should be otherwise in the path of the portion 30.

On the outer side, the vertical wall of the slide 27 has its lower marginal portion 31 turned obliquely outwardly and upwardly, as best shown in Figures 4 and 7, forming with the vertical portion a V-shaped channel and provided at intervals with slots 32, in which a coupling plate 33 may be loosely engaged, said coupling plate having lips 34 which extend through the slots 32 and are bent to form retaining hooks for the coupling member.

The upper margin of the coupling member has its end portions 35 outwardly turned and its middle portion notched at 36 to receive an operating arm 37, carried by a horizontally extending rod 38 connected with an exterior operating rack bar 39, which may be actuated by the pinion 40 and crank 41.

if the operating arm 37 is then in register with the notch 36, the coupling member 33 will be pushed backwardly to the dotted line posi-

to tilt all of the egg supporting cages ried by the associated tray frame. cages may thus be tilted to the dotted position of Figure 2, or reversely tilted the full line position of Figure 5, thus ing or tipping the eggs sufficiently to the nuclei from settling out of place.

The front and rear walls or bars of tray frame are exactly alike, and the of the egg cages are exactly alike. fore the slide 27 may be applied to wall 10 or 11, with equal facility, and the tray is inserted, the wall which the slide will be regarded as the rear and will be pushed into the incubator This effects a saving of considerable in the operation of large incubators taining many trays to be handled. ing that the incubating chamber contains series of trays in superposed relation to other, as indicated in Figure 4, the ing arm 37 may be extended upwardly downwardly from the rod 38, whereby plurality of slides 27 may be simultaneously shifted from a single rod 38.

It will be noted that the slide not only acts as a shifter to tilt the egg cages, but also serves to hold the egg cages in their tilted position by reason of the fact that the slide projections 28 are engaged in the notches 25 in the end walls of the cages. These projections can be inexpensively formed by splitting the material comprising the inner wall of the slide and bending the material between two slits outwardly in the form of a projecting lip.

The separately insertible cages facilitate candling operations, each row of eggs being exposed to rays of light from below which pass through the slots formed by removing the central bottom bar from the lower margins of the side walls. The eggs in the rows, none are apt to be missed in the candling operation, and each cage is of convenient size to be handled and manipulated over the lamp for candling purposes of eggs successively. The trunnions and trunnion receiving slots afford convenient means for quick removal and replacement of successive cages.

By mounting each cage to oscillate on an axial line which extends longitudinally of the cage in proximity to, but above, its center of gravity

will now be described.

It will be observed that each of the end walls of the egg cages is provided with a notch 25 extending downwardly in the wall from its upper margin and substantially in line with the slot 22. A sheet metal channel-shaped slide 27 is adapted to fit over the upper margin of the tray frame and between it and the upwardly projecting marginal portions of the associated egg cages, the inner wall of the slide being provided with projections 28 positioned for entry in the notches 25 of the end walls of the cages. At intervals these slides may be provided on their inner side with guiding extensions 30, which furnish side bearings, both vertically and laterally, to prevent the slide 27 from tilting upon the upper margin of the tray frame. The ends of these projections 30 may be notched to prevent them from interfering with the movement of the slide, if one of the studs 13 should be otherwise in the path of the portion 30.

On the outer side, the vertical wall of the slide 27 has its lower marginal portion 31 turned obliquely outwardly and upwardly, as best shown in Figures 4 and 7, forming with the vertical portion a V-shaped channel and provided at intervals with slots 32, in which a coupling plate 33 may be loosely engaged, said coupling plate having lips 34 which extend through the slots 32 and are bent to form retaining hooks for the coupling member.

The upper margin of the coupling member has its end portions 35 outwardly turned and its middle portion notched at 36 to receive an operating arm 37, carried by a horizontally extending rod 38 connected with an exterior operating rack bar 39, which may be actuated by the pinion 40 and crank 41.

When the tray is placed in the incubator, if the operating arm 37 fails to register with the notch 36, the coupling member 33 will be pushed backwardly to the dotted line position in which it is illustrated in Figure 7, where it will remain until the rack bar 39 and rod 38 are shifted by the pinion and crank to bring the arm 37 into registry with the notch. The coupling member 33 will then drop by gravity to the position by which it is indicated by full lines in Figure 7, after which a continued movement of the rod 38, in either direction, will be transmitted to the slide.

Whenever the slide 27 has been engaged by an operating arm 37, it may be actuated

tray frame are exactly alike, of the egg cages are exactly alike. fore the slide 27 may be applied to wall 10 or 11, with equal facility, and the tray is inserted, the wall which the slide will be regarded as the and will be pushed into the incubator This effects a saving of considerable in the operation of large incubators taining many trays to be handled. ing that the incubating chamber contains series of trays in superposed relation to other, as indicated in Figure 4, the operating arm 37 may be extended upwardly downwardly from the rod 38, whereby plurality of slides 27 may be simultaneously shifted from a single rod 38.

It will be noted that the slide not only acts as a shifter to tilt the egg cages, but also serves to hold the egg cages in their tilted position by reason of the fact that the slide projections 28 are engaged in the notches 25 in the end walls of the cages. These projections can be inexpensively formed by splitting the material comprising the inner wall of the slide and bending the material between two slits outwardly in the form of a projecting lip.

The separately insertible cages facilitate candling operations, each row of eggs being exposed to rays of light from below, which pass through the slots formed by spacing the central bottom bar from the lower margins of the side walls. The eggs being in rows, none are apt to be missed during a candling operation, and each cage is of a convenient size to be handled and manipulated over the lamp for candling the rows of eggs successively. The trunnions and trunnion receiving slots afford convenient means for quick removal and replacement of successive cages.

By mounting each cage to oscillate on an axial line which extends longitudinally of the cage in proximity to, but slightly above, its center of gravity, the power required for tilting is reduced to a minimum and maximum tilting or turning effect on the eggs are obtained, consistent with stability in operation.

It will be observed that all portions of the egg cages are included within the space between the upper and lower margins of the tray frames. This makes it possible to remove a series of tray frames and stack them one upon another preparatory to filling the cages with eggs, or for any other

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where economy of space or convenience resulting from the piling of one tray upon another, becomes important.

I claim:

1. An egg supporting cage for incubators, comprising the combination with a pair of end walls, of a set of sheet metal walls, arcuate in cross section and upwardly divergent, and a co-operating longitudinally extending central bottom bar composed of convergent ridge forming members spaced from the side walls connecting the end walls and co-operating with the side walls to support parallel rows of eggs of various sizes in substantially fixed relation to each other.

2. An egg supporting cage for incubators, comprising the combination with a pair of end walls having open ended slots extending upwardly from their bottom margins, of a set of sheet metal walls, arcuate in cross section and upwardly divergent, and a co-operating longitudinally extending central bottom bar, having convergent ridge forming sides also connecting the end walls and co-operating with the side walls to support parallel rows of eggs, in a substantially fixed relation to each other together with a tray frame having pairs of trunnions engageable in said slots, and the ends of the bottom bars being cut away to allow the trunnions to enter the slots to engage the ends of parallel egg trays, the axes of said trunnions being in lines adjacent to the centers of gravity of their respective cages, and means, associated with the cages, for simultaneously tilting them about said axes in opposite directions from vertical planes through said axes.

3. An incubator egg tray, comprising the combination with a tray frame provided with spaced trunnions projecting inwardly from its front and rear walls and axially aligned in pairs, egg receiving cages, each having notched end walls, and adapted to be supported within the tray frame when a pair of trunnions are engaged in the end notches, said notches having the form of open ended slots adapted to allow the cages to move downwardly to a point with their centers of gravity slightly below the level of the trunnions, and a slide removably mounted upon one wall of the tray frame automatically engageable with the cages to tilt the same upon said trunnions, said slide having projections adapted to ride upon the cages into position for interlocking engagement with the cages.

4. An incubator egg tray, comprising the combination with a tray frame provided with inwardly projecting pairs of trunnions, egg supporting cages having end walls provided with open ended slots extending upwardly from their bottom margins, and adapted to receive said trunnions when a pair of trunnions are engaged in the end wall notches, said notches having the form of open slots adapted to allow the cages to move downwardly to a point with their centers of gravity slightly below the level of the trunnions, and a slide mounted upon one wall of the tray frame and automatically engageable with the cages when moved along said wall to tilt the same upon said trunnions, when the slide is actuated each cage being formed of sheet metal strips adapted to allow rows of eggs to become loosely wedged between them and between which strips air may circulate throughout the egg receiving space.

5. An incubator egg tray, comprising the combination with a tray frame having inwardly projecting pairs of trunnions, and egg supporting cages having end walls provided with open ended slots extending upwardly from the bottom margins of the end walls and adapted to receive said trunnions, said end walls being also formed with beveled margins and an intermediate notch for interlocking engagement with a slide actuator, and a slide actuator carried by the tray frame and formed to ride over said beveled margins and loosely interlock with the notched end walls of the cages, and to tilt the same about the axes of said trunnions.

6. An egg tray for incubators comprising the combination with a tray frame, of a series of elongated parallel egg cages, each adapted to loosely support two rows of eggs, each cage having a central bar downwardly pitched in opposite directions from a longitudinal center line in the lower portion of the cage, and side bars of sheet metal, arcuate in cross section, with lower portions convergent toward said central bar and co-operative therewith for supporting rows of eggs between them and the central bar, the space between the side and central bar portions being open and unobstructed, whereby eggs of differing sizes may each find its own anchorage between such convergent portions and be held with stability when the cage is laterally tilted.

7. An incubator egg tray, comprising the combination of a series of longitudinally elongated egg supporting cages having end walls provided with upwardly extending open ended trunnion receiving slots and downwardly extending open ended slide re-

a co-operating longitudinally extending central bottom bar composed of convergent ridge forming members spaced from the side walls connecting the end walls and co-operating with the side walls to support parallel rows of eggs of various sizes in substantially fixed relation to each other.

2. An egg supporting cage for incubators, comprising the combination with a pair of end walls having open ended slots extending upwardly from their bottom margins, of a set of sheet metal walls, arcuate in cross section and upwardly divergent, and a co-operating longitudinally extending central bottom bar, having convergent ridge forming sides also connecting the end walls and co-operating with the side walls to support parallel rows of eggs, in a substantially fixed relation to each other together with a tray frame having pairs of trunnions engageable in said slots, and the ends of the bottom bars being cut away to allow the trunnions to enter the slots to engage the ends of parallel egg trays, the axes of said trunnions being in lines adjacent to the centers of gravity of their respective cages, and means, associated with the cages, for simultaneously tilting them about said axes in opposite directions from vertical planes through said axes.

3. An incubator egg tray, comprising the combination with a tray frame provided with spaced trunnions projecting inwardly from its front and rear walls and axially aligned in pairs, egg receiving cages, each having notched end walls, and adapted to be supported within the tray frame when a pair of trunnions are engaged in the end wall notches, said notches having the form of open ended slots adapted to allow the cages to move downwardly to a point with their centers of gravity slightly below the level of the trunnions, and a slide removably mounted upon one wall of the tray frame and loosely engageable with the cages to tilt the same upon said trunnions, said slide having portions adapted to ride upon the ends of the cages into position for interlocking engagement therewith during cage tilting movements of the slide, whereby each of the cages is made independently removable.

4. An incubator egg tray comprising the combination with a tray frame provided with spaced trunnions projecting inwardly from its front and rear walls and axially aligned in pairs, egg receiving cages, each having notched end walls and adapted to be supported within the tray frame when said wall to tilt the same upon said trunnions, when the slide is actuated each cage being formed of sheet metal strips adapted to allow rows of eggs to become loosely wedged between them and between which strips air may circulate throughout the egg receiving space.

5. An incubator egg tray, comprising the combination with a tray frame having inwardly projecting pairs of trunnions, and egg supporting cages having end walls provided with open ended slots extending upwardly from the bottom margins of the end walls and adapted to receive said trunnions, said end walls being also formed with beveled margins and an intermediate notch for interlocking engagement with a slide actuator, and a slide actuator carried by the tray frame and formed to ride over said beveled margins and loosely interlock with the notched end walls of the cages, and to tilt the same about the axes of said trunnions.

6. An egg tray for incubators comprising the combination with a tray frame, of a series of elongated parallel egg cages, each adapted to loosely support two rows of eggs, each cage having a central bar downwardly pitched in opposite directions from a longitudinal center line in the lower portion of the cage, and side bars of sheet metal, arcuate in cross section, with lower portions convergent toward said central bar and co-operative therewith for supporting rows of eggs between them and the central bar, the space between the side and central bar portions being open and unobstructed, whereby eggs of differing sizes may each find its own anchorage between such convergent portions and be held with stability when the cage is laterally tilted.

7. An incubator egg tray, comprising the combination of a series of longitudinally elongated egg supporting cages having end walls provided with upwardly extending open ended trunnion receiving slots and downwardly extending open ended slide receiving notches.

8. An incubator egg tray, comprising the combination with a tray frame, of a series of elongated egg receiving cages having end walls provided with upwardly extending open ended trunnion receiving slots and downwardly extending open ended slots to receive an actuator, trunnions carried by the tray frame in positions for registry with the upwardly extending slots, and a slide car-

ried by the tray frame and provided with projections adapted to be engaged in said notches, whereby a movement of the slide will cause a tilting movement of each egg cage upon its supportiing trunnions, said slide being longitudinally channeled to receive one wall of the tray frame and having the outer wall of the channel provided with a coupling member adapted to be engaged by an operating rod.

9. In an incubator egg supporting and egg tilting mechanism, the combination of an egg tray frame provided with a series of parallel egg cages separately connected with the front and rear walls of the frame and independently removable therefrom, by mere manipulation, a slide carried by one of said frame walls and adapted for interlocking engagement with the egg trays, an actuating rod extending along the slide carrying wall of the tray frame and provided with a slide actuating arm, and an oscillatory coupling member carried by the slide in a position for interlocking engagement with said arm.

10. In an incubator egg supporting and egg tilting mechanism, the combination of an egg tray frame provided with a series of parallel egg cages separately connected with the front and rear walls of the frame and independently removable therefrom, a slide carried by one wall of said frame and adapted for interlocking engagement with the egg trays, an actuating rod extending along the slide carrying wall of the tray frame and provided with a slide actuating arm, and a yieldable coupling member carried by the slide and adapted to automatically engage said operating arm in one position of relative adjustment of the arm and slide.

11. An incubator egg supporting and egg tilting mechanism, comprising the combination of parallel egg supporting cages independently pivoted to the tray frame and independently removable therefrom, each egg supporting cage being adapted to receive two rows of eggs in parallel relation to each other and extending from points adjacent to the front and rear walls of the tray frame across the space between them, and an independently movable and removable slide mounted upon the upper margin of one tray wall and engageable with said cages to tilt

tilting slide mounted upon one wall of the frame and provided with interior projections for oscillating egg supports within the tray, an exterior coupling, and a slide actuator extending along one side of the tray and engageable with the coupling by axial movement, said coupling being automatically movable transversely of the slide actuator to engage the same.

14. An incubator egg tray having a series of independently removable egg cages supported for oscillation about longitudinal axial lines passing near their respective centers of gravity, and adapted to support substantially parallel rows of eggs, the bottoms of said cages being sufficiently open to permit candling operations and to allow eggs of differing sizes to find anchorage at the margins of the openings, whereby each egg may be supported in substantially fixed relation to the cage.

15. In an incubator egg tray, the combination with a tray frame and a set of separately removable egg receiving cages having upwardly convergent upper margins provided with means for engagement of an actuating slide therewith, of a slide associated with one wall of the tray frame and adapted to automatically engage an unconnected cage by movement along its upper margin to said means for permitting slide engagement.

16. In an incubator egg tray, the combination with a tray frame and a set of separately removable egg receiving cages, of a slide associated with one wall of the tray frame and adapted to automatically move transversely into engagement with unconnected cages when the latter are in position within the frame, a slide actuator movable along one side of the slide, and automatically acting coupling means movable transversely of the slide and its actuator for operatively connecting them with each other when the actuator is being moved independently of the slide.

17. An incubator egg tray having [illegible] front and rear walls in combination with a series of longitudinally elongated egg supporting cages, each having like end walls provided with upwardly extended, open ended trunnion receiving slots and downwardly extended, open ended slide receiving notches, a channel shaped slide adapted to be mounted upon either of said

the outer wall of the channel provided with a coupling member adapted to be engaged by an operating rod.

9. In an incubator egg supporting and egg tilting mechanism, the combination of an egg tray frame provided with a series of parallel egg cages separately connected with the front and rear walls of the frame and independently removable therefrom, by mere manipulation, a slide carried by one of said frame walls and adapted for interlocking engagement with the egg trays, an actuating rod extending along the slide carrying wall of the tray frame and provided with a slide actuating arm, and an oscillatory coupling member carried by the slide in a position for interlocking engagement with said arm.

10. In an incubator egg supporting and egg tilting mechanism, the combination of an egg tray frame provided with a series of parallel egg cages separately connected with the front and rear walls of the frame and independently removable therefrom, a slide carried by one wall of said frame and adapted for interlocking engagement with the egg trays, an actuating rod extending along the slide carrying wall of the tray frame and provided with a slide actuating arm, and a yieldable coupling member carried by the slide and adapted to automatically engage said operating arm in one position of relative adjustment of the arm and slide.

11. An incubator egg supporting and egg tilting mechanism, comprising the combination of parallel egg supporting cages independently pivoted to the tray frame and independently removable therefrom, each egg supporting cage being adapted to receive two rows of eggs in parallel relation to each other and extending from points adjacent to the front and rear walls of the tray frame across the space between them, and an independently movable and removable slide mounted upon the upper margin of one tray wall and engageable with said cages to tilt them upon their pivotal axes, said slide, when removed, permitting removal of individual cages.

12. In an incubator egg tray the combination with a tray frame, of a channeled egg tilting slide mounted upon and loosely embracing one wall of the frame, and egg supporting means engageable by said slide for tilting the eggs.

13. In an incubator egg tray the combination with a tray frame, of a channeled egg

cally movable transversely of the ... tuator to engage the same.

14. An incubator egg tray having a ... of independently removable egg cages ... ported for oscillation about longitudi... axial lines passing near their respective ... ters of gravity, and adapted to support ... stantially parallel rows of eggs, the bottoms ... of said cages being sufficiently open to permit candling operations and to allow eggs of differing sizes to find anchorage at the margins of the openings, whereby each egg may be supported in substantially fixed relation to the cage.

15. In an incubator egg tray, the combination with a tray frame and a set of separately removable egg receiving cages having upwardly convergent upper margins provided with means for engagement of an actuating slide therewith, of a slide associated with one wall of the tray frame and adapted to automatically engage an unconnected cage by movement along its upper margin to said means for permitting slide engagement.

16. In an incubator egg tray, the combination with a tray frame and a set of separately removable egg receiving cages, of a slide associated with one wall of the tray frame and adapted to automatically move transversely into engagement with unconnected cages when the latter are in position within the frame, a slide actuator movable along one side of the slide, and automatically acting coupling means movable transversely of the slide and its actuator for operatively connecting them with each other when the actuator is being moved independently of the slide.

17. An incubator egg tray having ... front and rear walls in combination with a series of longitudinally elongated egg ... porting cages, each having like end ... provided with upwardly extended, ... ended trunnion receiving slots and ... wardly extended, open ended slide receiving notches, a channel shaped slide adapted to be mounted upon either of said walls and to receive such wall in its channel, said slide having projections adapted to engage in the downwardly extending slots of the respective cages at either end thereof, and the outer wall of the slide channel being provided with means for coupling it to a slide actuator.

18. An incubator egg tray having ... front and rear walls in combination with a series of longitudinally elongated egg ... porting cages, each having like end ...

provided with upwardly extended, open trunnion receiving slots and downwardly extended, open ended slide receiving notches, a channel shaped slide adapted to be mounted upon either of said walls and to receive such wall in its channel, said slide having projections adapted to engage in the downwardly extending slots of the respective cages at either end thereof, and the outer wall of the slide channel being provided with means for coupling it to a slide actuator, each end wall of each cage being also provided with inclined margins along which the slide projection may move to a position of engagement in the downwardly extending slot for automatically coupling the slide to the cage when the slide is reciprocated by its actuator.

19. In an egg tray, a series of tiltable egg supporting cages, in combination with a slide mounted upon one wall of the tray and having portions extending downwardly along one side of the wall for engagement with the cages and another portion extending downwardly along the other side of the wall for engagement with an actuator.

20. In an egg tray, a series of tiltable egg supporting cages, in combination with a slide mounted upon one wall of the tray and having portions extending downwardly along one side of the wall for engagement with the cages and another portion extending downwardly along the other side of the wall for engagement with an actuator, said last mentioned portion having its lower margin provided with an outwardly and upwardly projecting flange, and a gravity actuated coupling member loosely interlocked with said flange and adapted to be tilted and allowed to drop into interlocking engagement with a slide actuator movable in a path normally occupied by portions of said coupling members.

21. An egg supporting cage for incubator trays, comprising the combination with end walls, of side and bottom members for said walls connecting the end walls and adapted to support parallel rows of eggs in spaced relation to each other, the bottom member comprising upwardly convergent walls having lower margins spaced from the side walls to provide open bottoms into which various size eggs can seat in substantially fixed relation.

22. An egg tray provided with parallel cage having its bottom formed of upwardly divergent egg supporting walls to engage and support eggs of various sizes at opposite points, said walls being laterally spaced apart to provide an unobstructed open bottom into which eggs of various sizes can project to find secure anchorage upon said divergent walls against lateral shifting.

GEORGE T. MARKEY.

wall of the slide channel being pro-
with means for coupling it to a slide
ator, each end wall of each cage being
provided with inclined margins along
h the slide projection may move to a
ion of engagement in the downwardly
ding slot for automatically coupling
slide to the cage when the slide is recip-
ated by its actuator.

19. In an egg tray, a series of tiltable egg supporting cages, in combination with a slide mounted upon one wall of the tray and having portions extending downwardly along one side of the wall for engagement with the cages and another portion extending downwardly along the other side of the wall for engagement with an actuator.

20. In an egg tray, a series of tiltable egg supporting cages, in combination with a slide mounted upon one wall of the tray and having portions extending downwardly along one side of the wall for engagement with the cages and another portion extending downwardly along the other side of the wall for engagement with an actuator, said last mentioned portion having its lower margin provided with an outwardly and upwardly projecting flange, and a gravity actuated coupling member loosely interlocked with said flange and adapted to be lifted and allowed to drop into interlocking engagement with a slide actuator movable along a path normally occupied by portions of the coupling members.

21. An egg supporting cage for incubators, comprising the combination with end walls, of side and bottom members for said walls connecting the end walls and adapted to hold parallel rows of eggs in spaced relation to each other, the bottom member comprising upwardly convergent walls having their lower margins spaced from the side walls to provide open bottoms into which various size eggs can seat in substantially fixed relation.

egg tray provided with parallel
provided with means for sup-
rows of eggs and each having
supporting bottom formed of up-
gent egg supporting walls, said
walls forming the sole support
various sizes to prevent lateral
the eggs.

egg tray, an egg cage adapted
parallel rows of eggs in posi-
ate candling operations, each

Dec. 22, 1931. G. T. MARKEY 1,837,458

AIR MIXER AND CIRCULATOR

Filed Oct. 6, 1928

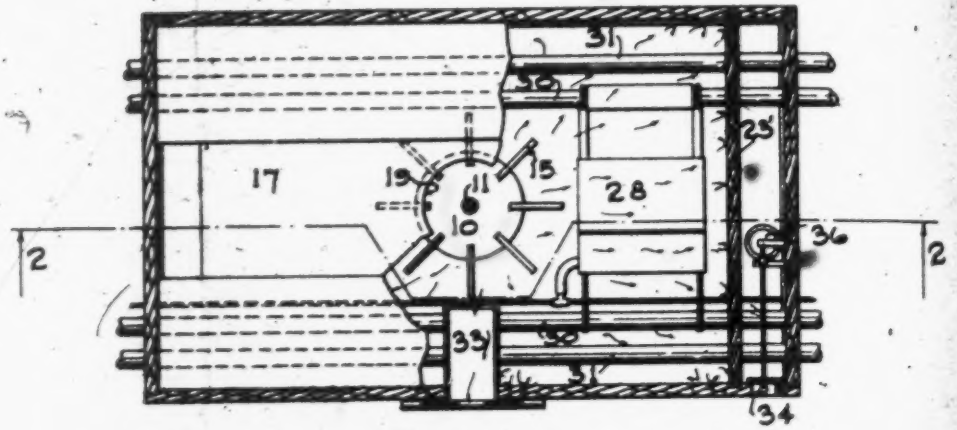


FIG. 1

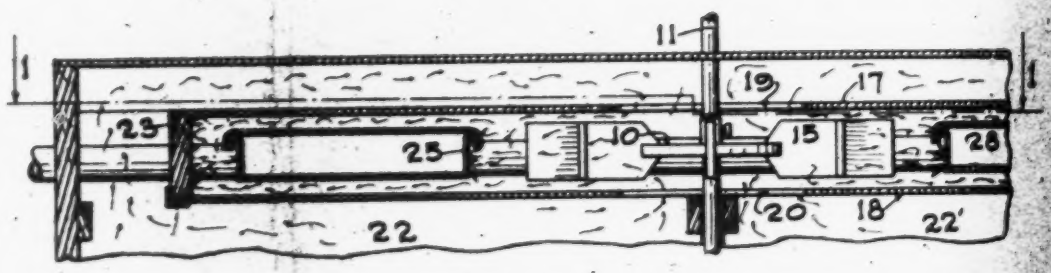
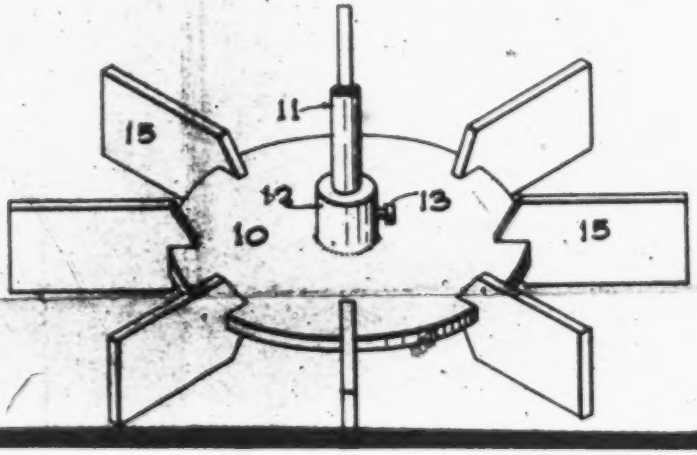


FIG. 2



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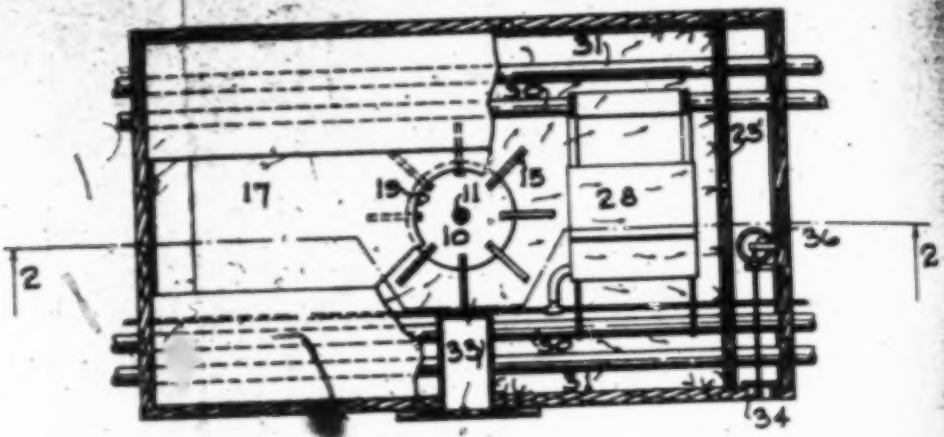

FIG. 1

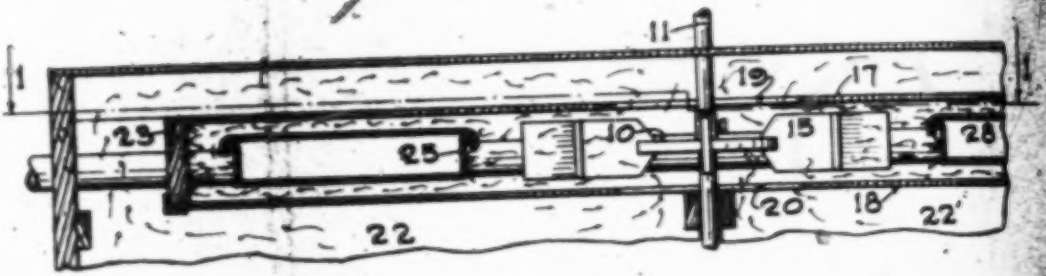

FIG. 2

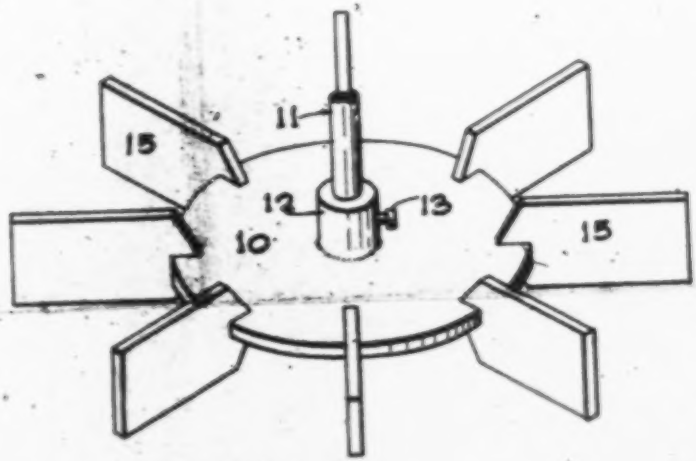

FIG. 3.

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UNITED STATES PATENT OFFICE

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AIR MIXER AND CIRCULATOR

Application filed October 6, 1928. Serial No. 310,280.

This invention relates to improvements in air mixers and circulators designed for use in homogenizing and circulating air in incubators and in general for churning and mixing air and gases.

Objects of this invention are to equalize the temperatures in a circulatory system, mix fresh air or gas with that which is being recirculated, maintain a uniform degree of purity in the system and vitalize air in such system by churning it and keeping it in motion.

It is also an object of this invention to provide means whereby air or gases derived from different sources of supply or from different portions of the same source of supply may be separately received and acted upon by the movable element of the churning device in such a manner that the air or gas from each source of supply will be mixed with that from the other source or sources to produce a homogeneous product.

A further object of this invention is to provide means, associated with the churning device, for delivering a predetermined percentage of the mixed product out of the system and replacing the quantity so delivered from an exterior source of supply while circulating and rechurning the remainder, and maintaining the circulating fluid uniformly in a constant condition as to temperature and purity.

In the drawings:

Figure 1 is a plan view (partly in horizontal section on line 1—1 of Figure 2) of an air mixer and circulator embodying my invention, showing the same as employed for [illegible] incubator.

means of the hub 12 and set screw 13. The outer margin of the plate or disk is provided with a series of radially projecting wings 15 similar to those of an ordinary centrifugal fan but preferably located in radial planes and having flat plane surfaces instead of being curved as is common in the construction of centrifugal fans.

It will be observed, however, that the wings 15 have their upper margins at a substantial distance above the plate or disk 10 and their lower margins at a substantial distance below it. In the construction shown, the portions above the disk are substantially equal in area to the portions below it, whereby, when the disk is rotated, air will be driven from space above and below the disk outwardly by centrifugal force in planes substantially parallel to that of the disk.

The disk is rotated between the two parallel walls 17 and 18, each of which is apertured to provide air inlet openings 19 and 20 respectively to admit air to space on opposite sides of the disk along the axis of the impeller formed by the disk and its radially projecting wings 15. The air reaching the impeller through the aperture 19 may come from a different source of supply from that reaching the impeller through the aperture 20. On the other hand it may come from different portions of the same space or chamber. For example, in the construction as shown in Figure 2, air from the space 22 may pass to the left around an end wall or baffle 23 connecting the walls 17 and 18 and this air may then pass inwardly toward the shaft 11 and downwardly through the opening 19, whereas air from the inner portion of

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AIR MIXER AND CIRCULATOR

Application filed October 6, 1922. Serial No. 593,660.

This invention relates to improvements in air mixers and circulators designed for use in homogenizing and circulating air in incubators and in general for churning and mixing air and gases.

Objects of this invention are to equalize the temperatures in a circulatory system, mix fresh air or gas with that which is being recirculated, maintain a uniform degree of purity in the system and vitalize air in such system by churning it and keeping it in motion.

It is also an object of this invention to provide means whereby air or gases derived from different sources of supply or from different portions of the same source of supply may be separately received and acted upon by the movable element of the churning device in such a manner that the air or gas from each source of supply will be mixed with that from the other source or sources to produce a homogeneous product.

A further object of this invention is to provide means, associated with the churning device, for delivering a predetermined percentage of the mixed product out of the system and replacing the quantity so delivered from an exterior source of supply while circulating and rechurning the remainder, and maintaining the circulating fluid uniformly in a constant condition as to temperature and purity.

In the drawings:

Figure 1 is a plan view (partly in horizontal section on line 1—1 of Figure 2) of an air mixer and circulator embodying my invention, showing the same as employed for circulating air in an incubator.

Figure 2 is a view of the same in vertical section drawn generally to line 2—2 of Figure 1.

Figure 3 is an isometric view of the rotary member.

Like parts are identified by the same reference characters throughout the several views.

A plate or disk 10 is secured to a shaft 11 which may be rotated from any suitable source of power. In the construction shown, the plate or disk is secured to the shaft by means of the hub 12 and set screw 13. The outer margin of the plate or disk is provided with a series of radially projecting wings 15 similar to those of an ordinary centrifugal fan but preferably located in radial planes and having flat plane surfaces instead of being curved as is common in the construction of centrifugal fans.

It will be observed, however, that the wings 15 have their upper margins at a substantial distance above the plate or disk 10 and their lower margins at a substantial distance below it. In the construction shown, the portions above the disk are substantially equal in area to the portions below it, whereby, when the disk is rotated, air will be driven from space above and below the disk outwardly by centrifugal force in planes substantially parallel to that of the disk.

The disk is rotated between the two parallel walls 17 and 18, each of which is apertured to provide air inlet openings 19 and 20 respectively to admit air to space on opposite sides of the disk along the axis of the impeller formed by the disk and its radially projecting wings 15. The air reaching the impeller through the aperture 19 may come from a different source of supply from that reaching the impeller through the aperture 20. On the other hand it may come from different portions of the same space or chamber. For example, in the construction as shown in Figure 2, air from the space 22 may pass to the left around an end wall or baffle 23 connecting the walls 17 and 18 and this air may then pass inwardly toward the shaft 11 and downwardly through the opening 19, whereas air from the inner portion of the space 22 may flow to the right toward the shaft 11 and upwardly toward the aperture 20 to the underside of the disk 10.

Both currents of air will be driven outwardly from the respective sides of the disk and upon striking any wall or baffle will be thoroughly intermingled, reversed, churned and distributed. For example, a portion of the air driven to the left in Figure 2 will strike the wall 25 of a pan or other receptacle and some of it will be diverted upwardly some downwardly and some later-

ally. Some will rebound in the direction of the impeller. Other portions are driven around the chamber of which the wall 25 is a part and continue until such portions strike the baffle wall 23 whereupon a similar eddying and churning result will be obtained. It may be assumed that the chamber of which the wall 25 is a part is similar to the chamber 28 illustrated at the right hand in Figure 1 and that the wall 23′ is similar to the wall 23 shown at the left in Figure 2.

It may be assumed that the space between the walls 17 and 18 is for outlets commensurate with the capacity of the inlet apertures 19 and 20. If there are no side walls between the baffle walls 23 and 23′ the air will, of course, be free to escape laterally and in the construction shown in Figure 1 this air may be driven across pipes 30 and 31 and downwardly in the space between these pipes from which it may eventually find its way back to the space 22 or 22′ illustrated in Figure 2, thereby establishing a circulatory system.

Some of the air may be driven out to the exterior through a laterally extending passage 33 and fresh air may be admitted to the system through a valved passage indicated at 34. In the construction shown, the valve at 34 is controlled by a thermostat 36 whereby the quantity of fresh air admitted may be controlled in accordance with the temperature of the air in the circulatory system. The employment of thermostatic control and the question as to whether fresh air or gas is to be admitted to the system in proportion to another quantity that is being expelled will, of course, depend in each case on the purpose of the system and the character of the fluid that is being handled. These features, including the pipes 30 and 31 and the chambers 28, form no part of the invention herein claimed but are adapted to be used in connection with an incubator described and claimed in my companion application, Serial No. 282,302, filed June 2, 1928 for a heating system for incubators.

They are referred to in this application [illegible] illustration of one manner in which my improved air mixing and circulating may be employed for obtaining homogeneous conditions in a

in another portion due to the presence of greater number of deflecting or obstructing objects and in either of the instances referred to the circulation tends to be unbalanced in both velocity and temperature. Insofar as the unbalanced condition for any given quantity of the circulating fluid exists during only one traverse of the system the injury may be slight, whereas, if allowed to accentuate by repetition, widely varying conditions of temperature, ventilation or other unequal effects may result. By employing a positively driven mixer and air circulator of the type herein disclosed high velocities may be checked, low velocities accelerated, temperatures equalized and uniform conditions otherwise maintained.

I claim:

1. An air mixing and circulating device comprising a generally rectangular chamber having substantially parallel walls provided with inlet apertures, an impeller driving shaft in a line substantially coinciding with the centers of said apertures and provided with a disk substantially parallel to said walls and provided with impeller wings extending on both sides of the plane of the disk, said chamber having baffles on two sides of the impeller wings disposed tangentially to circles concentric with the disk and arranged to break up the air currents generated by the wings and commingle the air coming from above the disk with that coming from below it, said walls having openings along the sides not occupied by the baffles adapted to allow delivery of the churning air from said chamber.

2. An air mixing and circulating device comprising a generally rectangular chamber having substantially parallel walls provided with inlet apertures, an impeller driving shaft in a line substantially coinciding with the centers of said apertures and provided with a disk substantially parallel to said walls and provided with impeller wings extending on both sides of the plane of the disk, said chamber having baffles on two sides of the impeller wings disposed tangentially to circles concentric with the disk and arranged to break up the air currents generated by the wings and commingle the air coming from above the disk with that coming

the wall 25 is a part is similar to the chamber 28 illustrated at the right hand in Figure 1 and that the wall 23′ is similar to the wall 23 shown at the left in Figure 2.

It may be assumed that the space between the walls 17 and 18 is for outlets commensurate with the capacity of the inlet apertures 19 and 20. If there are no side walls between the baffle walls 23 and 23′ the air will, of course, be free to escape laterally and in the construction shown in Figure 1 this air may be driven across pipes 30 and 31 and downwardly in the space between these pipes from which it may eventually find its way back to the space 22 or 22′ illustrated in Figure 2, thereby establishing a circulatory system.

Some of the air may be driven out to the exterior through a laterally extending passage 33 and fresh air may be admitted to the system through a valved passage indicated at 34. In the construction shown, the valve at 34 is controlled by a thermostat 36 whereby the quantity of fresh air admitted may be controlled in accordance with the temperature of the air in the circulatory system. The employment of thermostatic control and the question as to whether fresh air or gas is to be admitted to the system in proportion to another quantity that is being expelled will, of course, depend in each case on the purpose of the system and the character of the fluid that is being handled. These features, including the pipes 30 and 31 and the chambers 28, form no part of the invention herein claimed but are adapted to be used in connection with an incubator described and claimed in my companion application, Serial No. 282,802, filed June 2, 1928 for a heating system for incubators.

They are referred to in this application for the purpose of explanation and illustration of one manner in which my improved air mixer and circulator may be employed for obtaining homogeneous conditions in a circulatory system which would otherwise show a constant tendency to become unbalanced as to temperature, rate of circulation in different portions of the system and in atmospheric purity. In the circulation of air through chambers having some walls exposed for heat radiation and other portions subject to little loss of heat the tendency is for the warmer air to rise in the portions where the heat loss is smallest and to descend in portions where the temperatures are lowest. Also in other systems the resistance may be greater in one portion of a chamber than during only one traverse of the sy... injury may be slight, whereas, if allo... accentuate by repetition, widely ... conditions of temperature, ventilat... other unequal effects may result. By e... ing a positively driven mixer and air ... lator of the type herein disclosed hig... locities may be checked, low velocities ... erated, temperatures equalized and uni... conditions otherwise maintained.

I claim:

1. An air mixing and circulating de... comprising a generally rectangular cha... having substantially parallel walls pro... with inlet apertures, an impeller driv... shaft in a line substantially coinciding ... the centers of said apertures and pro... with a disk substantially parallel to said wa... and provided with impeller wings exte... on both sides of the plane of the disk, sa... chamber having baffles on two sides of the impeller wings disposed tangentially to ci... cles concentric with the disk and arranged t... break up the air currents generated by the wings and commingle the air coming fro... above the disk with that coming from belo... it, said walls having openings along the sid... not occupied by the baffles adapted to allo... delivery of the churning air from said cha... ber.

2. An air mixing and circulating de... comprising a generally rectangular cha... having substantially parallel walls pro... with inlet apertures, an impeller driv... shaft in a line substantially coinciding ... the centers of said apertures and pro... with a disk substantially parallel to sa... walls and provided with impeller wings ex... tending on both sides of the plane of the dis... said chamber having baffles on two sides ... the impeller wings disposed tangentially to circles concentric with the disk and ar... to break up the air currents generated ... wings and commingle the air comi... above the disk with that coming fro... it, said wall having openings along ... not occupied by the baffles, adapted ... delivery of the churning air from sa... ber, and additional walls spaced ... walls of said chamber across the p... delivered air and adapted to dir... in planes transverse to that in wh... peller revolves.

3. An air mixing and circula... comprising a chamber having ... parallel walls oppositely apert... ginally unconnected along two ... vide slot-like outlets, a rotary

cated between the inlet apertures and revoluble in a central plane substantially parallel to said walls, and a set of current interrupting eddy producing baffles located at a substantial distance from the impeller on two sides of its axis and across the space between the ends of the outlets, said baffles and the first mentioned walls forming a mixing chamber of a generally rectangular form.

GEORGE T. MARKEY.

chamber of a generally rectangular form.

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Dec. 19, 1933. G. T. MARKEY 1,939,908

HEATING SYSTEM FOR INCUBATORS

Filed June 2, 1928 4 Sheets-Sheet 1

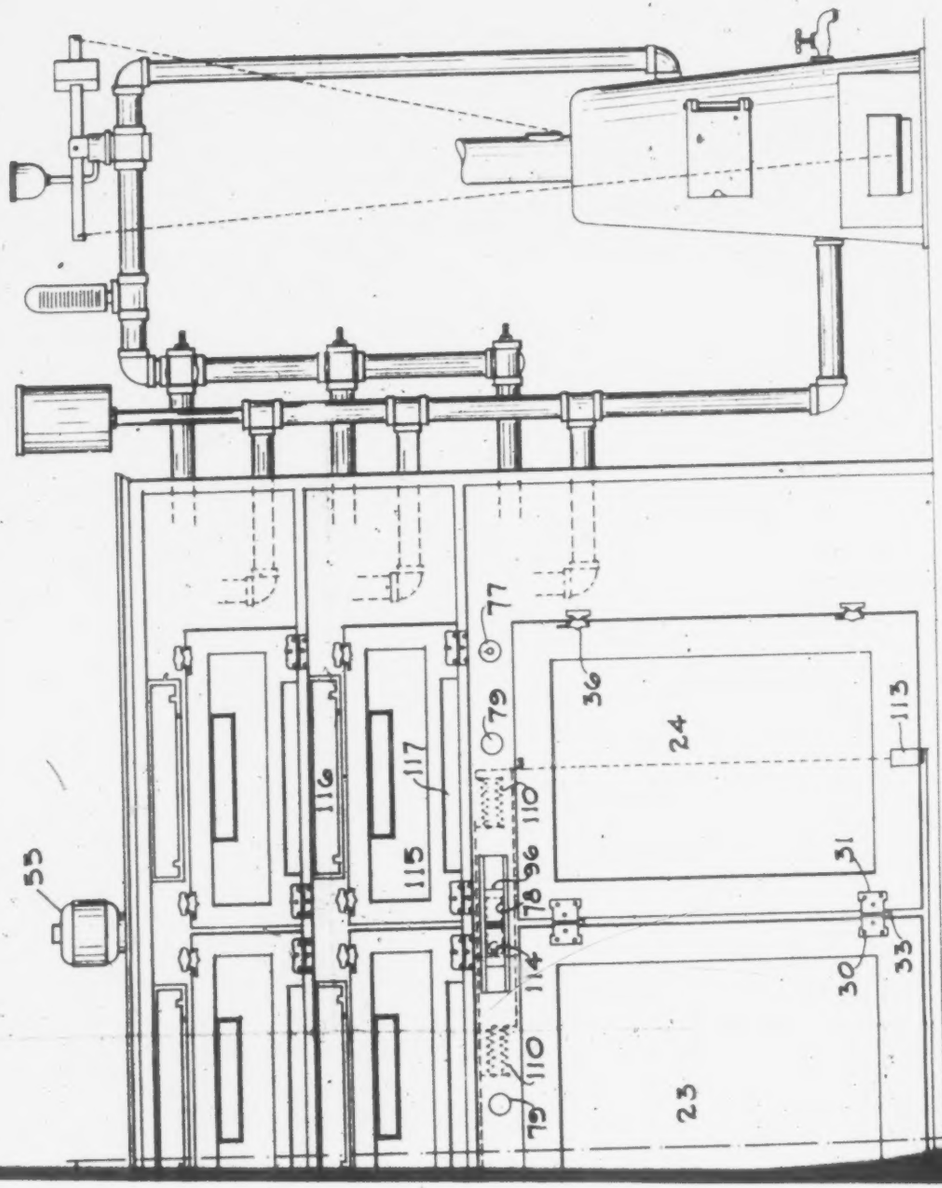

FIG. 1

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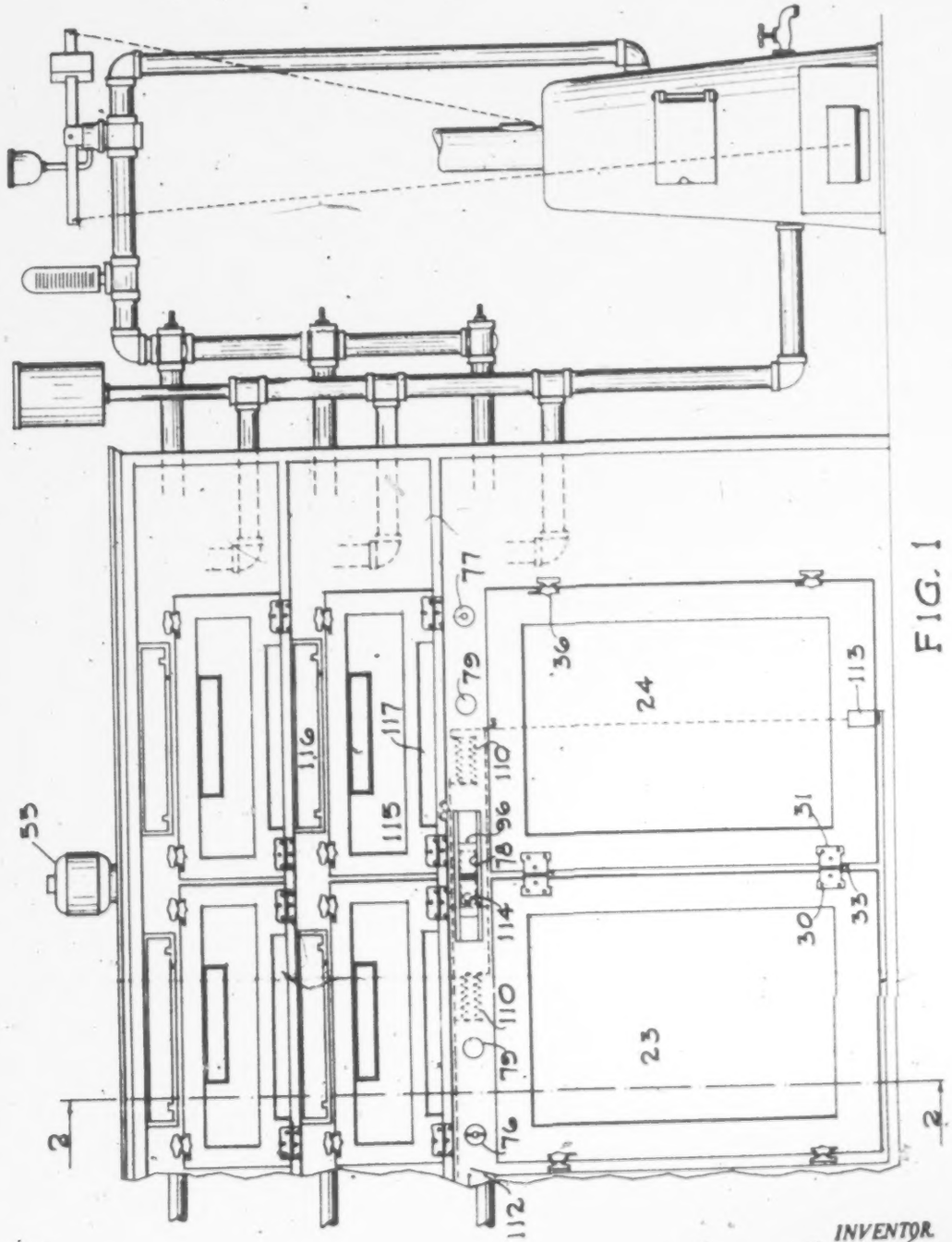

FIG. 1

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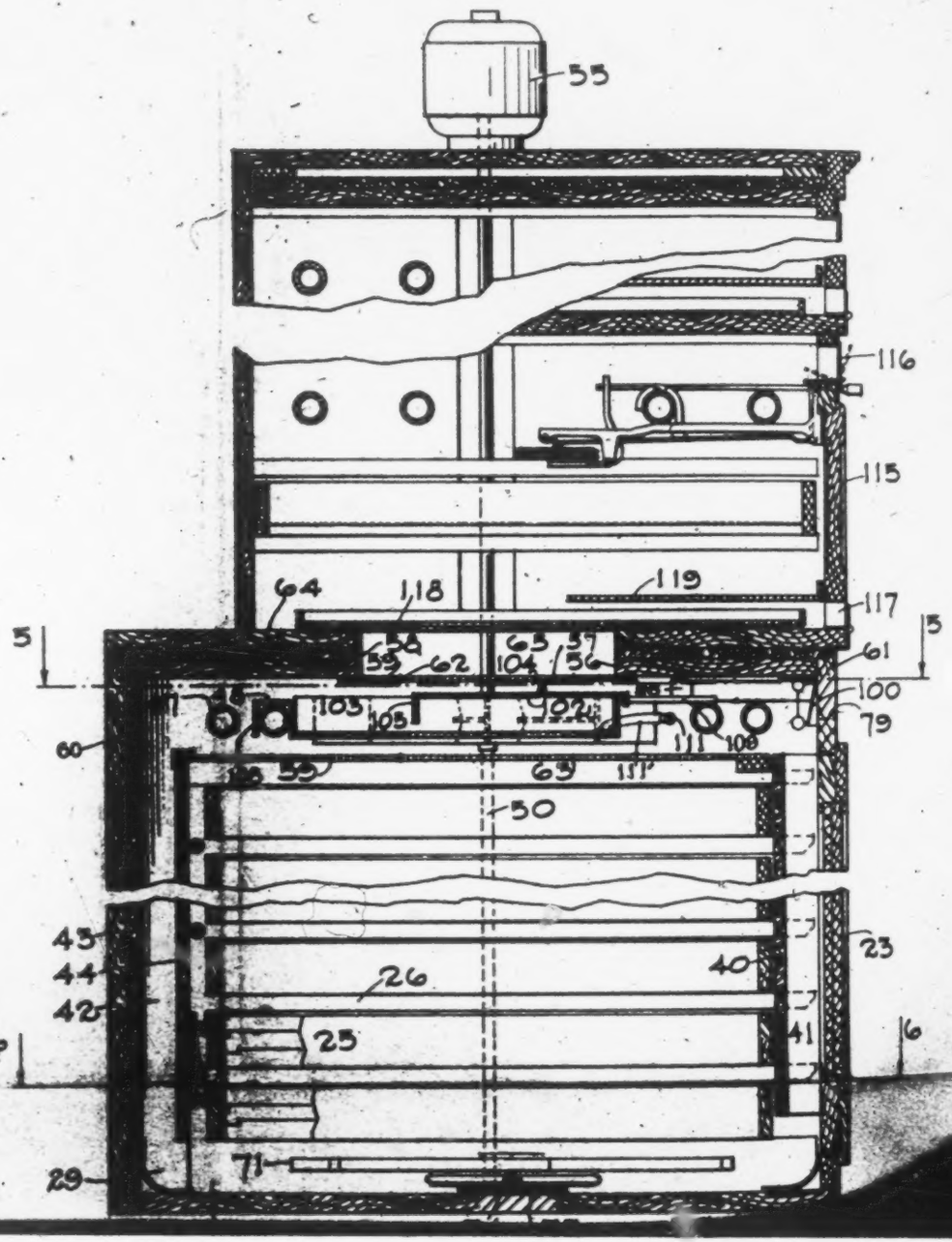
HEATING SYSTEM FOR INCUBATORS

Filed June 2, 1928 4 Sheets-Sheet 2



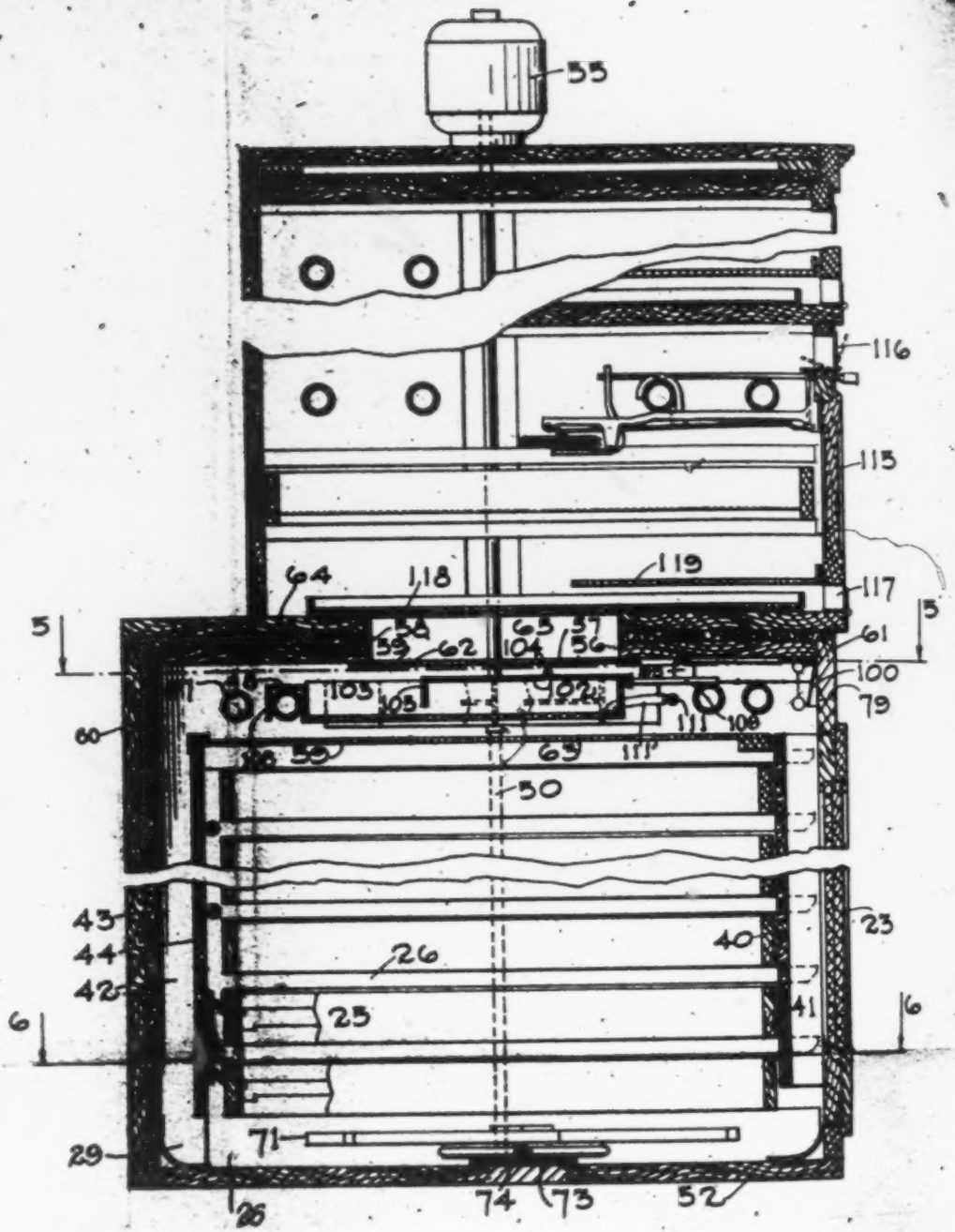


FIG. 2.

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HEATING SYSTEM FOR INCUBATORS

Filed June 2, 1928 4 Sheets-Sheet 3

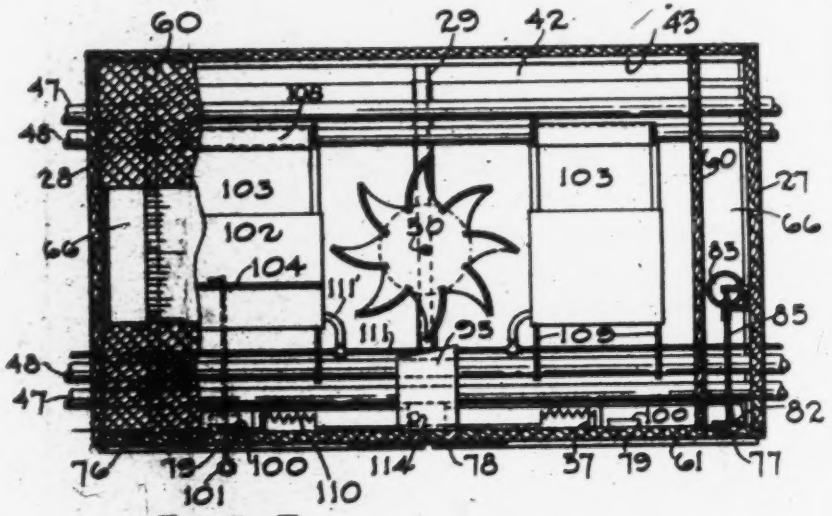
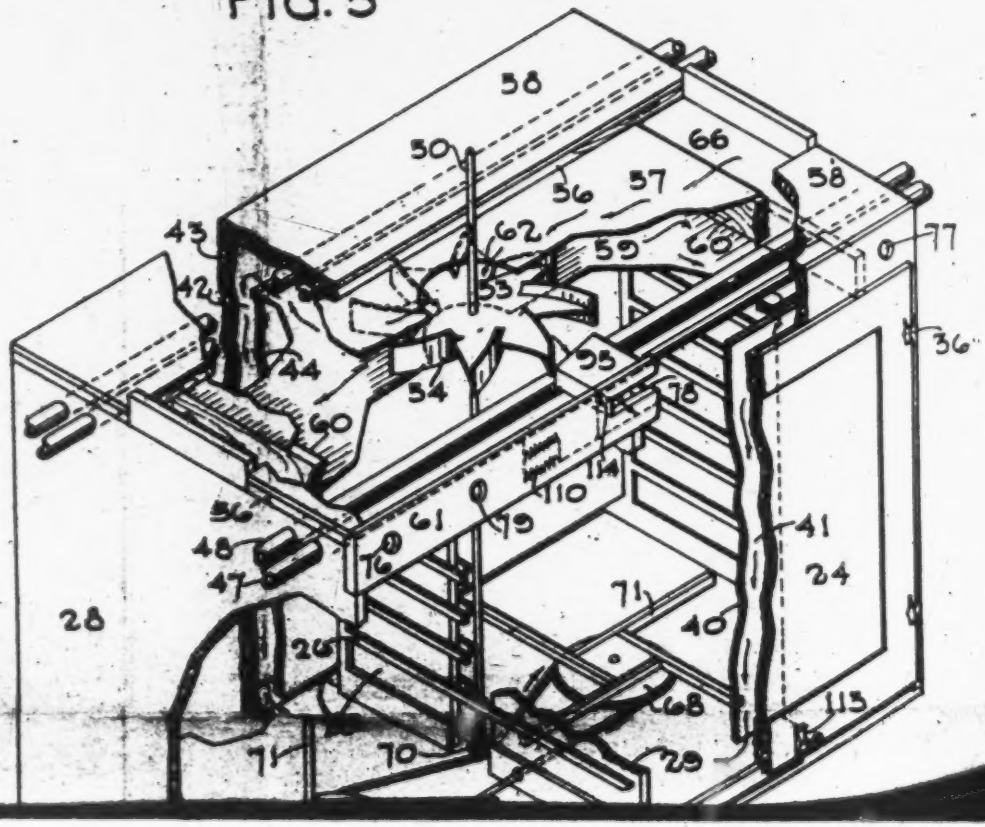


FIG. 5



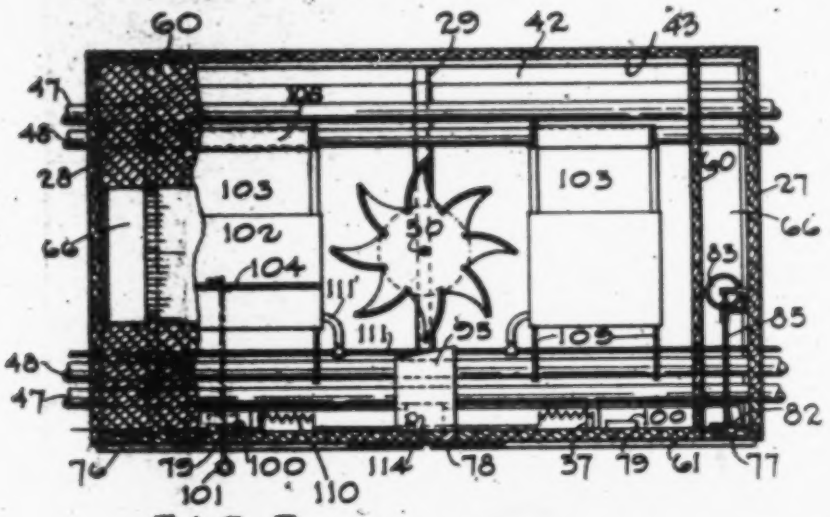


FIG. 5

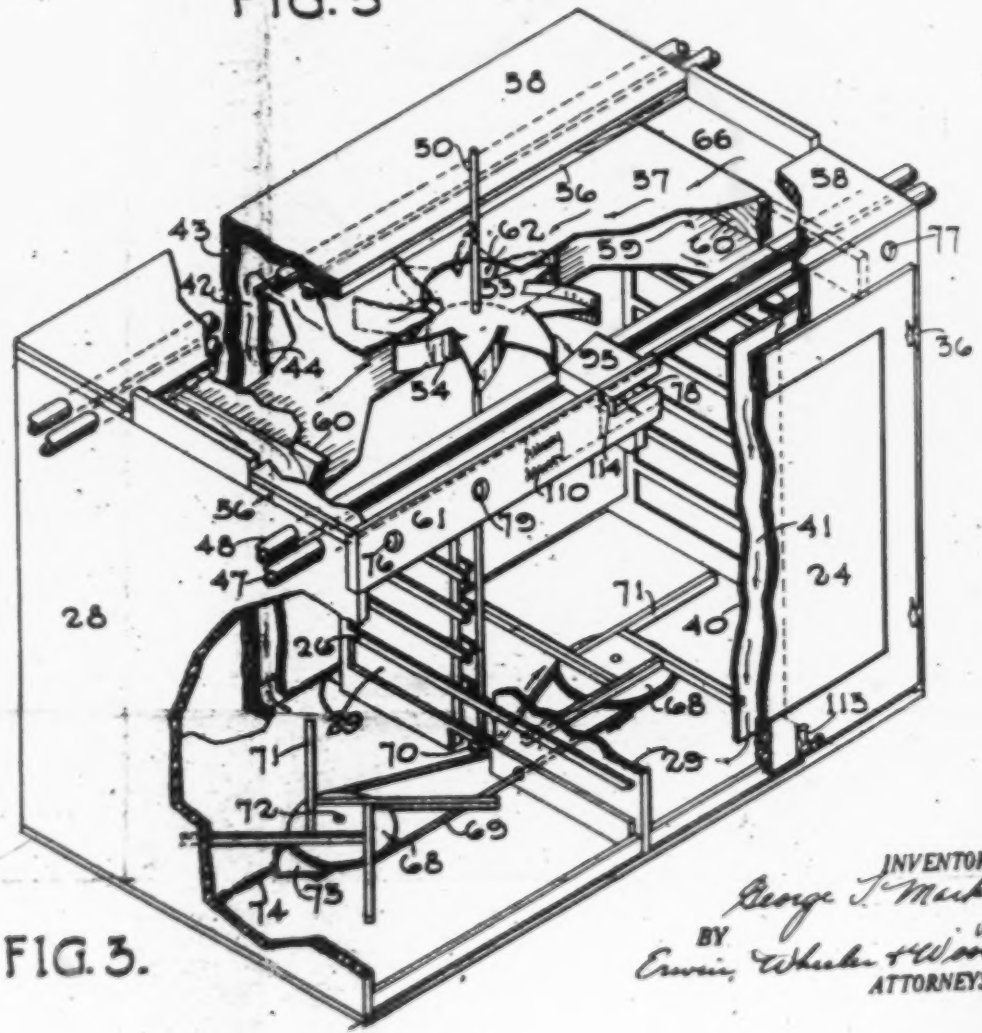


FIG. 3.

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Dec. 19, 1933. G. T. MARKEY 1,939,908

HEATING SYSTEM FOR INCUBATORS

Filed June 2, 1928 4 Sheets-Sheet 4

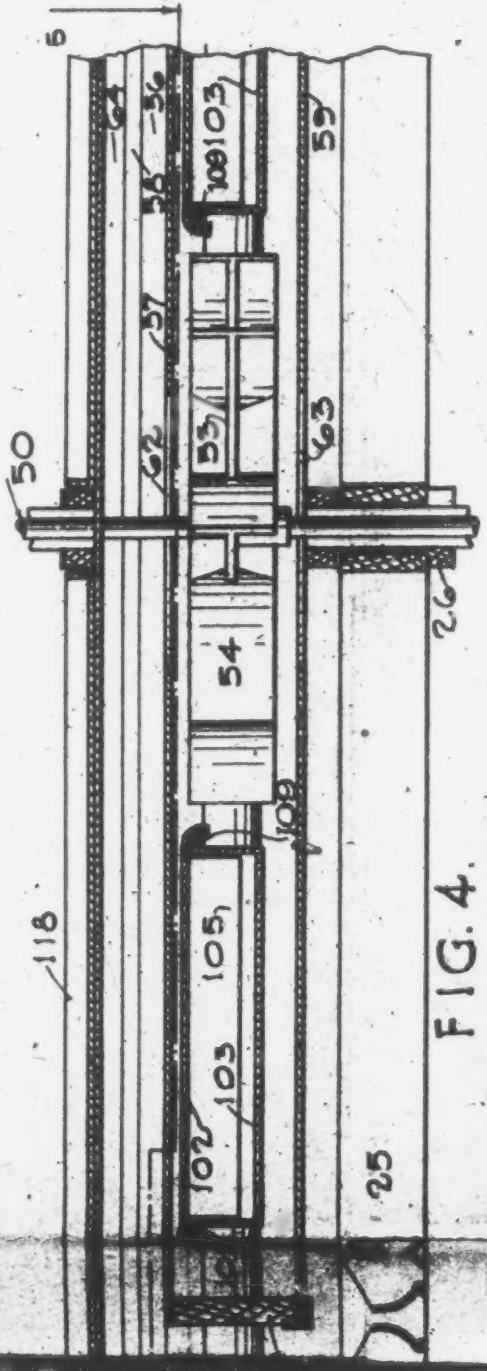

FIG. 4.

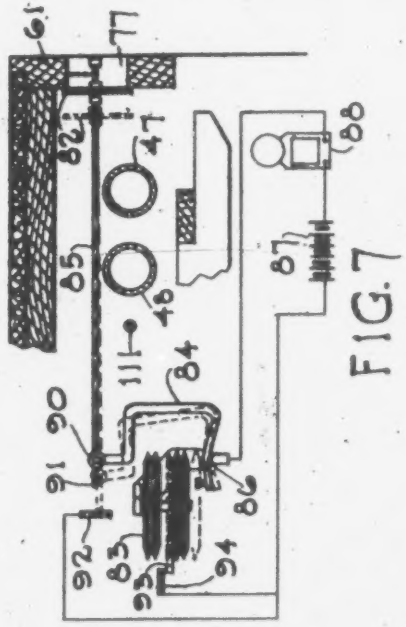

FIG. 7

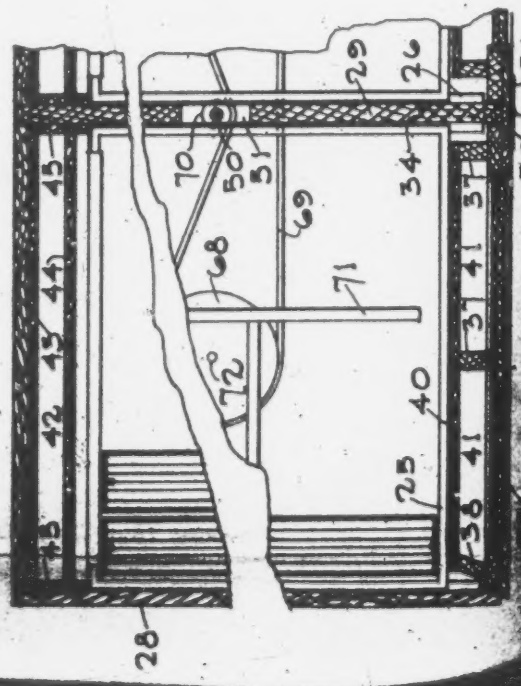

FIG. 6

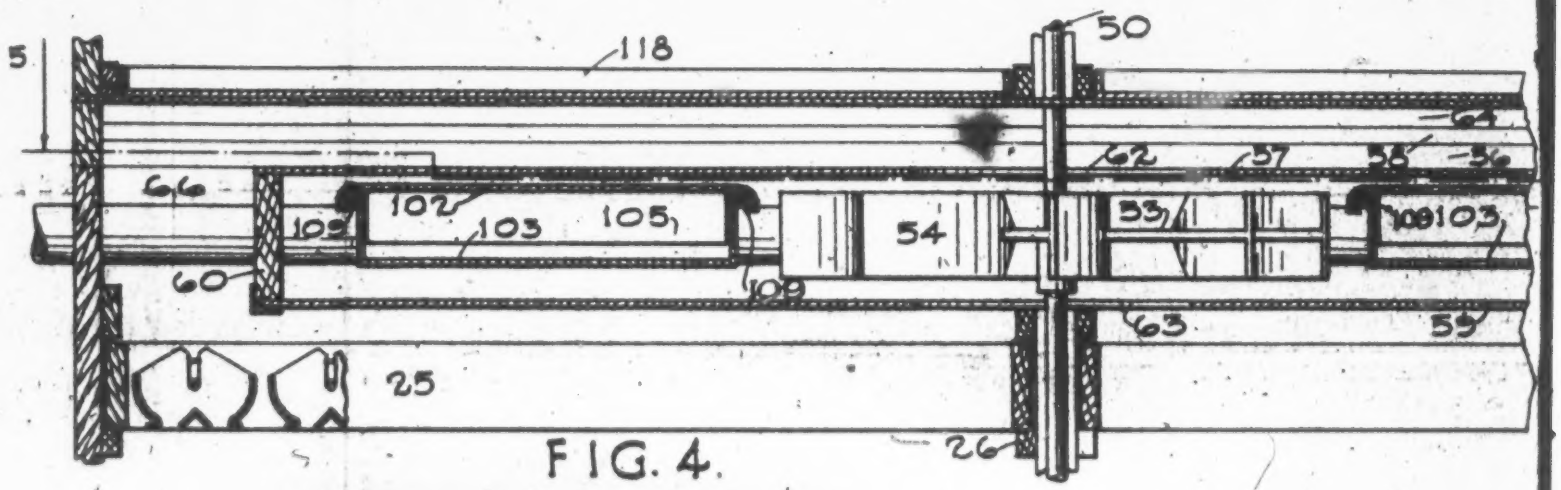

FIG. 4.

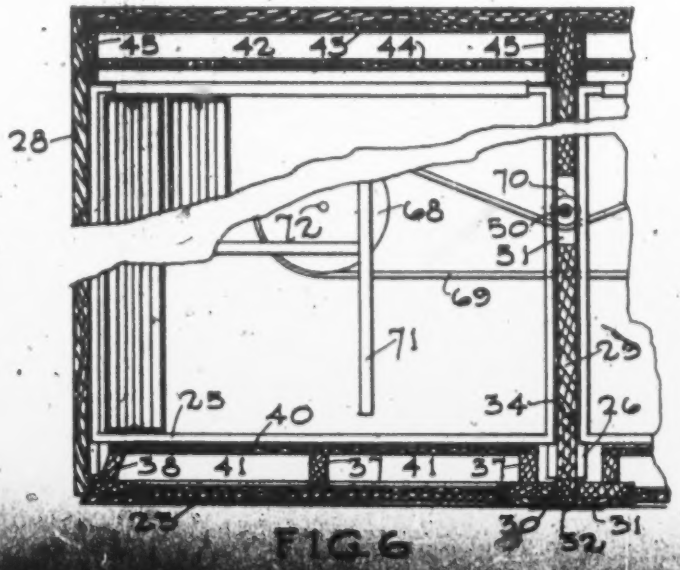

FIG. 6

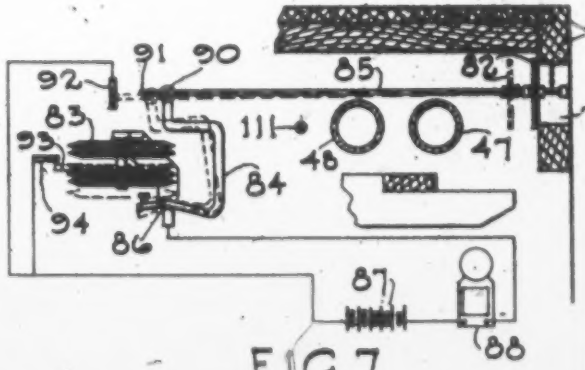

FIG. 7

INVENTOR
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Patented Dec. 19, 1933 1,939,968

UNITED STATES PATENT OFFICE

1,939,968

HEATING SYSTEM FOR INCUBATORS

George T. Markey, Fort Atkinson, Wis., assignor to James Manufacturing Company, Fort Atkinson, Wis., a corporation of Wisconsin

Application June 2, 1932. Serial No. 615,393

14 Claims. (Cl. 119—35)

This invention relates to improvements in heating systems for incubators of the general type in which power driven means are employed to promote air mixing, primarily for heating, heat distributing purposes and for air vitalization by mixing, ventilation being accomplished by introduction of fresh air at different points in the incubator chamber to facilitate the mixing of the air, the distribution of heat and the control of heat and moisture.

The primary object of this invention is to provide adequate means for maintaining a correct temperature and moisture conditions uniformly in all portions of the incubator.

It is my object to provide means for churning the air and, at the same time, causing a vacuum in the top of a stack of egg trays, delivering the churned air over humidifying means for controlling its humidity and reducing its temperature, restoring its temperature, introducing fresh air into the churned air, evacuating a portion of the air that has once passed over the eggs and returning the remainder of the air thus humidified, heated and churned to where it can be again churned, mixed and diffused, preferably in combination with incoming air, and then allowed to [illegible] gently between diffusing supports of numerous eggs by convection and also due to the creation of a vacuum at the top of the eggs due to the churning of the air in a separated space above the eggs thereby avoiding drafts, hot and cold spots and forced circulation of air which would move the air so rapidly that it would be unable properly treat the eggs.

It is my object to avoid previous mistakes in the prior art of using forced draft machines in which large quantities of air are taken in and changed every few minutes.

More specifically stated my objects are:—to provide major heat supplying means with auxiliary intermittently and independently operable means sensitive to control than the

which the aforesaid results may be accomplished with due regard for compactness and maximum egg receiving capacity in proportion to the size of the structure.

Further objects are to provide improved means for mechanically promoting air mixing in aid of uniform heating, vitalization, and uniform admission and distribution of fresh air without radical change of temperature in any egg tray receiving portion of the incubator; to provide adequate means for according different treatment of eggs in advanced stages of incubation from that accorded to the eggs in the primary stages of incubation, with particular reference to the heating requirements; to utilize the moving air of a power driven air mixing system for an effective insulation of eggs from external temperature conditions during the earlier stages of their incubation; to provide improved power driven means for mixing and directing the course of the heat carrying and distributing air currents within an incubator; to provide co-operating means distant from the mixing means for thoroughly mixing all portions of the air and obtaining absolute uniformity in its temperature preparatory to its flow over the surfaces of the eggs; to provide improved means for controlling the fresh air inlet apertures, whereby the admission of such air is, in part, made intermittent and subject to temperature conditions within the incubator to accomplish the double purpose of ventilation and heat control or limitation. The method disclosed in this application is claimed in copending application, Serial No. 664,795, filed April 6, 1933. Reference is made to Patent No. 1,837,458, issued December 22, 1931, to George T. Markey, which claims certain subject matter disclosed herein.

In the drawings:

Figure 1 is a front elevation of an incubator unit embodying the invention herein claimed, the heating pipes and a wall fragment being ex-

HEATING SYSTEM FOR INCUBATORS

George T. Marksy, Fort Atkinson, Wis., assignor to James Manufacturing Company, Fort Atkinson, Wis., a corporation of Wisconsin

Application June 2, 1933. Serial No. 673,283

14 Claims. (Cl. 119—35)

This invention relates to improvements in heating systems for incubators of the general type in which power driven means are employed to promote air mixing, primarily for heating, heat distributing purposes and for air vitalization by mixing, ventilation being accomplished by introduction of fresh air at different points in the incubator chamber to facilitate the mixing of the air, the distribution of heat and the control of heat and moisture.

The primary object of this invention is to provide adequate means for maintaining a correct temperature and moisture conditions uniformly in all portions of the incubator.

It is my object to provide means for churning the air and, at the same time, causing a vacuum in the top of a stack of egg trays, delivering the churned air over humidifying means for controlling its humidity and reducing its temperature, restoring its temperature, introducing fresh air into the churned air, evacuating a portion of the air that has once passed over the eggs and returning the remainder of the air thus humidified, heated and churned to where it can be again churned, mixed and diffused, preferably in combination with incoming air, and then allowed to rise gently between diffusing supports of numerous eggs by convection and also due to the creating of a vacum at the top of the eggs due to the churning of the air in a separated space above the eggs thereby avoiding drafts, hot and cold spots and forced circulation of air which would move the air so rapidly that it would be unable to suitably treat the eggs.

It is my object to avoid previous mistakes in the prior art of using forced draft machines in which large quantities of air are taken in and discharged every few minutes.

More specifically stated my objects are:—to provide major heat supplying means with auxiliary intermittently and independently operable heating means more sensitive to control than the major heating means, the latter being preferably designed to operate within a range below maximum permissible temperatures; to utilise the auxiliary heating means for operating a signal in case of extreme emergency; to provide for moving heat distributing air currents over all of the heat radiating surfaces in such a manner as to keep such surfaces, and the air in contact therewith, from becoming overheated and deviating; to provide improved means for mixing and maintaining the circulating air in a uniform condition of temperature, humidity and purity; and to provide an incubator structure in which the aforesaid results may be accomplished with due regard for compactness and maximum egg receiving capacity in proportion to the size of the structure.

Further objects are to provide improved means for mechanically promoting air mixing in aid of uniform heating, vitalization, and uniform admission and distribution of fresh air without radical change of temperature in any egg tray receiving portion of the incubator; to provide adequate means for according different treatment of eggs in advanced stages of incubation from that accorded to the eggs in the primary stages of incubation, with particular reference to the heating requirements; to utilise the moving air of a power driven air mixing system for an effective insulation of eggs from external temperature conditions during the earlier stages of their incubation; to provide improved power driven means for mixing and directing the course of the heat carrying and distributing air currents within an incubator; to provide co-operating means distant from the mixing means for thoroughly mixing all portions of the air and obtaining absolute uniformity in its temperature preparatory to its flow over the surfaces of the eggs; to provide improved means for controlling the fresh air inlet apertures, whereby the admission of such air is, in part, made intermittent and subject to temperature conditions within the incubator to accomplish the double purpose of ventilation and heat control or limitation. The method disclosed in this application is claimed in copending application, Serial No. 664,795, filed April 6, 1933. Reference is made to Patent No. 1,837,458, issued December 22, 1931, to George T. Marksy, which claims certain subject matter disclosed herein.

In the drawings:

Figure 1 is a front elevation of an incubator unit embodying the invention herein claimed, the heating pipes and a wall fragment being extended to indicate their connection with a duplicate unit.

Figure 2 is a sectional view drawn generally on line 2—2 of Figure 1.

Figure 3 is an isometric view of the lower or the incubating section with parts of the walls broken away to show the interior.

Figure 4 is a fragmentary view (enlarged) in vertical section taken at right angles to that of Figure 2.

Figure 5 is a fragmentary view in horizontal section drawn to line 5—5 of Figure 2.

Figure 6 is a fragmentary view, also in hori-

zontal section, drawn to line 6—6 of Figure 2.

Figure 7 is a detailed view of the thermostatically controlled air inlet valve controlling mechanism and alarm signal, a portion of the heat chamber wall being illustrated in vertical section.

Like parts are identified by the same reference characters throughout the several views.

The incubator herein described is adapted to be constructed in one or more units which may be placed in a longitudinal series of any desired number of similar units connected with a common source, or sources, of heat and power. As shown in the drawings, each unit comprises one or more, (preferably a pair), of lower chambers, which, for convenience in description, will be designated as the incubating chambers, and taken together, these two chambers will be termed the incubating section of the unit in distinction from the upper section composed of hatching chambers. Access to the incubating chambers may be had through the doors 23 and 24 respectively. These incubating chambers are each designed to receive a considerable number of egg trays 25, one above the other and in close proximity, the distance between the trays being substantially equal to the vertical thickness of their supporting rails 26.

For convenience in description, the walls 27 and 28 of the incubating chambers will be referred to as the side walls of the incubating section, although, in a multiple series of units, these walls might be partition walls common to adjacent units. By way of distinction in the present description the wall 29 between the two incubating chambers will be designated as the central partition wall.

The doors 23 and 24 are hinged together, the leaves 30 and 31 having butts which receive a pintle 32, the lower end of which is extended and socketed in the head 33 of a screw 34 which is threaded into the central partition 29. The swinging margins of the doors are provided with latches 36 of any ordinary construction adapted to engage suitable catches carried by the side walls or door jambs. Each of the doorways may thus be made equal in width to the width of the chamber, the door constituting the entire front wall, from a point or line below the lowermost egg tray to a point or line above the uppermost egg tray, and when the door is opened, all of the trays in that chamber may be drawn out and replaced.

Also each door is double walled, and made to form part of the heat, fresh air and moisture distributing system, the outer and inner walls being separated from each other by the vertically extended strips 37 and 38. The strip 38 is located at the swinging margin of the door and is obliquely pitched to allow the door to close. The inner door wall 40 is attached to these spacing

the horizontally extending heating pipes 47 and 48, which are preferably paired and arranged to extend along and adjacent to the front and rear wall respectively. This space constitutes the heating chamber. The pipes 47 may be assumed to be the outflow pipes and the pipes 48 the return-flow pipes.

A motor driven shaft 50 extends vertically through the center of the incubating section and upwardly through the hatching section in the incubator. The partition 29 is provided with a slot 51 to receive the shaft 50, the lower end of the shaft having a bearing in the bottom 52 of the incubating section. A stirrer like impeller is secured to the shaft 50, which is approximately midway between the pairs of heating pipes 47 and 48. This impeller is composed of a horizontally disposed central web 53 and arcuate wings 54 perpendicular to the web, each wing being secured to the web along its arcuate center line, whereby air may be mixed and moved outwardly from the central portion of the impeller on each side of the web in substantially equal volumes. An electric motor 55 drives the shaft 50, the latter being the motor shaft, or a shaft coupled end to end thereto. The action of the impeller stirrer 54 results in creating a vacuum by the movement of the air through the aperture 63. This provides an area of reduced pressure in the top portion of the egg chamber into which the air gently flows.

The impeller operates underneath upper wall members 56, 57 and 58, the members 56 and 58 being the top walls of the incubating section, which support the hatching section. The wall member 57 is a thin metal strip which spans the space between the wall members 56 and 58 and is secured to their under surfaces along their inner margins. This forms the top wall of what may be termed an impeller chamber, the bottom wall 59 of which is spaced from the wall members 57 by the end walls 60 of the housing. These housing end walls extend entirely across the heating chamber from the rear wall of the incubator section to the front wall member 61 above the doors. The pipes 47 and 48 extend through apertures in these wall members 60.

The housing walls 57 and 59 have central apertures or impeller chamber inlets 63 and 64 respectively (Figure 4) through which air may reach the impeller, the air being drawn through the apertures by suction as in an ordinary centrifugal fan, except for the fact that the horizontally disposed disc 53 separates the current of air entering through the upper impeller inlet 63 from that entering through the lower impeller inlet 64.

The air reaches the upper opening 63 through a passage 65 in the top wall members 56 and 58 extending across the central portion of the incubator parallel to the front and

number of similar units connected with a common source, or sources, of heat and power. As shown in the drawings, each unit comprises one or more, (preferably a pair), of lower chambers, which, for convenience in description, will be designated as the incubating chambers, and taken together, these two chambers will be termed the incubating section of the unit in distinction from the upper section composed of hatching chambers. Access to the incubating chambers may be had through the doors 23 and 24 respectively. These incubating chambers are each designed to receive a considerable number of egg trays 25, one above the other and in close proximity, the distance between the trays being substantially equal to the vertical thickness of their supporting rails 26.

For convenience in description, the walls 27 and 28 of the incubating chambers will be referred to as the side walls of the incubating section, although, in a multiple series of units, these walls might be partition walls common to adjacent units. By way of distinction in the present description the wall 29 between the two incubating chambers will be designated as the central partition wall.

The doors 23 and 24 are hinged together, the leaves 30 and 31 having butts which receive a pintle 32, the lower end of which is extended and socketed in the head 33 of a screw 34 which is threaded into the central partition 29. The swinging margins of the doors are provided with latches 36 of any ordinary construction adapted to engage suitable catches carried by the side walls or door jambs. Each of the doorways may thus be made equal in width to the width of the chamber, the door constituting the entire front wall, from a point or line below the lowermost egg tray to a point or line above the uppermost egg tray, and when the door is opened, all of the trays in that chamber may be drawn out and replaced.

Also each door is double walled, and made to form part of the heat, fresh air and moisture distributing system, the outer and inner walls being separated from each other by the vertically extended strips 37 and 38. The strip 38 is located at the swinging margin of the door and is obliquely pitched to allow the door to close. The inner door wall 40 is attached to these spacing strips 37 and 38 so that vertical passages 41 are formed in each door.

The opposing wall, herein termed the rear wall of the unit, is also double and is formed with a corresponding passage 42 between the outer wall member 43 and the inner wall member 44, these two wall members being separated by the spacing strips 45. These passages 41 and 42 in the doors and rear wall respectively, receive the mixed air in the system associated with the heating chamber now to be described.

Between the upper egg tray or trays in the incubating section and the top wall members 56 of such section, sufficient space is provided for a slot 51 to receive the shaft 50, the lower [illegible] of the shaft having a bearing in the bottom [illegible] of the incubating section. A stirrer like impeller is secured to the shaft 50, which is approximately midway between the pairs of heating pipes 47 and 48. This impeller is composed of a horizontally disposed central web 53 and arcuate wings 54 perpendicular to the web, each wing being secured to the web along its arcuate central line, whereby air may be mixed and moved outwardly from the central portion of the impeller on each side of the web in substantially equal volumes. An electric motor 55 drives the shaft 50, the latter being the motor shaft, or a shaft [illegible] coupled end to end thereto. The action of the impeller stirrer 54 results in creating a vacuum by the movement of the air through the aperture 63. This provides an area of reduced pressure in the top portion of the egg chamber into which the air gently flows.

The impeller operates underneath upper wall members 56, 57 and 58, the members 56 and 58 being the top walls of the incubating section, which support the hatching section. The wall member 57 is a thin metal strip which spans the space between the wall members 56 and 58 and is secured to their under surfaces along their inner margins. This forms the top wall of what may be termed an impeller chamber, the bottom wall 59 of which is spaced from the wall members 57 by the end walls 60 of the housing. These housing end walls extend entirely across the heating chamber from the rear wall of the incubator section to the front wall member 58, [illegible] above the doors. The pipes 47 and 48 extend through apertures in these wall members 60.

The housing walls 57 and 59 have central apertures or impeller chamber inlets 62 and 63 respectively (Figure 4) through which air may reach the impeller, the air being drawn through the apertures by suction as in an ordinary centrifugal fan, except for the fact that the horizontally disposed disc 53 separates the current of air entering through the upper impeller inlet 62 from that entering through the lower impeller inlet 63.

The air reaches the upper opening 62 through a passage 65 in the top wall members 56 and 58 extending across the central portion of the incubator parallel to the front and rear walls. The bottom wall 64 of the hatching chamber hereinafter described is preferably slotted to increase the vertical dimensions of this passage in order that air may flow freely through it to the open spaces 66 between the end walls of the impeller housing and the side walls of the section. Part of the mixed air may pass outwardly through the egg trays and through the spaces 66 and then over the housing wall into the passage 65 and to the impeller through aperture 62. But the air ascending through these portions of the egg trays nearest the central partition will be deflected inwardly by the under surface of the lower housing wall

and to the under side of the impeller through the impeller inlet 63.

The end walls 60 of the impeller housing extend entirely across the incubator unit from front to rear as above explained, and the air thrown against them by the impeller is churned and deflected laterally to the heating pipes in eddies and counter currents in a manner peculiarly adapted to absorb and distribute the heat units without devitalizing the air as is done in cases where more prolonged contacts of particles of air with heated surfaces are permitted. This churning air also receives and distributes air from the moisture pans, and this aids in vitalization or/and in preventing devitalization. This churning air is also being constantly thrown by the impeller laterally as well as longitudinally and caused to pass downwardly in the passages 41 and 42, into the space between the bottom of the incubator and the lowest egg tray 25. Within this space, on each side of the central partition, horizontally disposed pulleys 68 are driven by a belt 69 from a pulley 70 on the motor driven shaft 50. Each of these pulleys is provided with a set of mixing arms 71 which preferably extend tangentially to an inner circle of the pulley and successively at right angles to each other. These arms and their associated pulleys revolve in the direction indicated by the arrows and thoroughly mix all of the air received from the front and rear passages preparatory to its upward movement through the egg trays.

The air passages in the front doors and rear walls form areas always occupied by warm air which act as insulating blankets on the sides of the column of egg trays to protect the eggs from cold air and to thereby prevent cold air impeding the convection flow within the egg chamber.

It will be observed that the currents of air enter the egg chamber horizontally from opposite sides and meet along a transverse center line, each opposing the momentum of the other and tending to cause an intermingling of the air along said line, said line including the axis of the mixing or distributing device having the mixing arms 71. Said arms are not formed to drive the air upwardly in the direction of the egg trays, but they operate in a horizontal plane and cut across the horizontal flowing sheets of air on each side of said center line thereby checking velocity and destroying momentum effects which would otherwise tend to produce an ascending column along the vertical plane of said center line. The air is thus distributed laterally, and has greater pressure or condensation than that exposed to the suction of the impeller above the egg trays, and it is obvious that it will flow upwardly through the trays and about the sides by reason of such differential pressures between the bottom and top portions of the chamber. The egg trays and eggs

and by dividing the ascending air so that one half of it travels laterally and passes around the end walls 60 of the impeller housing and the other half passes underneath the impeller housing to its bottom inlet 63, and by operating the impeller within the housing to again divide the air and move it laterally toward the front and rear into the passages 41 and 42, the development of either concentrated current or so called dead spots in the egg containing portions of the incubator chambers is absolutely prevented and a uniform temperature maintained in all portions thereof. Owing to the fact that the air is heated just prior to its descent through the passages 41 and 42 to the bottom portion of the egg chambers, maximum heating efficiency is attained, and the churning and mixing currents, added to the flow of air into the passages bring such a relatively large number of particles of air into contact with the heating surfaces that such surfaces may be kept relatively cool by rapid absorption of heat units, as compared with the heating surfaces in gravity systems, or even those in ordinary forced draft systems wherein all the air travels in one direction over such surfaces.

To insure continued operation of the mixing device by the belt 69, one of its pulleys is preferably provided with a stud shaft 72 carried by a slide 73 which is connected by a spring 74 with one wall of the chamber, whereby the belt 69 may be constantly maintained under a driving tension.

One of the means for renewing the air supply and continuously venting a sufficient portion of the air to carry off the exhalations from the eggs and the means for humidifying the circulating air will now be described.

The portion 61 of the front wall of the incubator, above the doors, is provided with a series of openings, viz. the openings 76, 77, 78 and 79. The opening 76 is a small circular opening which may be left constantly open for the admission of a small quantity of fresh air into one of the spaces 66 between the associated end wall 60 of the housing and the side wall 28. The air admitted through this opening will pass upwardly and inwardly along the passage 65 to the impeller to be churned, mixed with the other air and heated as above described. The opening 77 is similarly located to admit air into the space 66 between the other end wall 60 of the housing and the side wall 27 and this air must also pass to the impeller and downwardly to the bottom of the incubating chamber before reaching the eggs.

The air from both of these openings will of course be mingled by the action of the impeller, but in order that the flow of air admitted through the two openings may be regulated to a certain extent in accordance with temperature conditions within the incubator, I preferably provide a controlling valve 82 for the aperture 77 and

air with heated surfaces are permitted. This churning air also receives and distributes air from the moisture pans, and this aids in vitalization and/or in preventing devitalization. This churning air is also being constantly thrown by the impeller laterally as well as longitudinally and caused to pass downwardly in the passages 41 and 42, into the space between the bottom of the incubator and the lowest egg tray 25. Within this space, on each side of the central partition, horizontally disposed pulleys 68 are driven by a belt 69 from a pulley 70 on the motor driven shaft 50. Each of these pulleys is provided with a set of mixing arms 71 which preferably extend tangentially to an inner circle of the pulley and successively at right angles to each other. These arms and their associated pulleys revolve in the direction indicated by the arrows and thoroughly mix all of the air received from the front and rear passages preparatory to its upward movement through the egg trays.

The air passages in the front doors and rear walls form areas always occupied by warm air which act as insulating blankets on the sides of the column of egg trays to protect the eggs from cold air and to thereby prevent cold air impeding the convection flow within the egg chamber.

It will be observed that the currents of air enter the egg chamber horizontally from opposite sides and meet along a transverse center line, each opposing the momentum of the other and tending to cause an intermingling of the air along said line, said line including the axis of the mixing or distributing device having the mixing arms 71. Said arms are not formed to drive the air upwardly in the direction of the egg trays, but they revolve in a horizontal plane and cut across the horizontally flowing sheets of air on each side of said center line thereby checking velocity and destroying momentum effects which would otherwise tend to produce an ascending column along the vertical plane of said center line. The air is thus distributed laterally, and has greater pressure or concentration than that exposed to the suction of the impeller above the egg trays, and it is obvious that it will flow upwardly through the trays and about the eggs by reason of such differential pressures in the bottom and top portions of the chamber and between egg trays. The egg trays and eggs thereon serve as baffles, compelling or tending to cause a uniform distribution of the air, the latter flowing to a considerable extent as air discharged from foraminous partitions. It will also be observed that the suction pull upon the air in the top portion of the chamber is exerted angularly to the planes of the air flow in the bottom portion, and, in fact substantially at right angles thereto. This also tends to prevent concentration of the air along paths of least resistance as in ordinary practice, and all these factors insure proper ventilation of all parts of the egg containing space. By providing these mixing devices underneath the egg trays and operating them in co-operation with the impeller and suitable air heating means, temperature maintained in all portions thereof. Owing to the fact that the air is heated just prior to its descent through the passages 41 and 42 to the bottom portion of the egg chambers, maximum heating efficiency is attained, and the churning and mixing currents, added to the flow of air into the passages bring such a relatively large number of particles of air into contact with the heating surfaces that such surfaces may be kept relatively cool by rapid absorption of heat units, as compared with the heating surfaces in gravity systems, or even those in ordinary forced draft systems wherein all the air travels in one direction over such surfaces.

To insure continued operation of the mixing device by the belt 69, one of its pulleys is preferably provided with a stud shaft 72 carried by a slide 73 which is connected by a spring 74 with one wall of the chamber, whereby the belt 69 may be constantly maintained under a driving tension.

One of the means for renewing the air supply and continuously venting a sufficient portion of the air to carry off the exhalations from the eggs and the means for humidifying the circulating air will now be described.

The portion 61 of the front wall of the incubator, above the doors, is provided with a series of openings, viz. the openings 76, 77, 78 and 79. The opening 76 is a small circular opening which may be left constantly open for the admission of a small quantity of fresh air into one of the spaces 66 between the associated end wall 60 of the housing and the side wall 28. The air admitted through this opening will pass upwardly and inwardly along the passage 65 to the impeller to be churned, mixed with the other air and heated as above described. The opening 77 is similarly located to admit air into the space 66 between the other end wall 60 of the housing and the side wall 27 and this air must also pass to the impeller and downwardly to the bottom of the incubating chamber before reaching the eggs.

The air from both of these openings will of course be mingled by the action of the impeller, but in order that the flow of air admitted through the two openings may be regulated to a certain extent in accordance with temperature conditions within the incubator, I preferably provide a controlling valve 82 for the aperture 77 and adjust this valve by means of a thermostat 83 which operates through a yoke shaped lever 84 and rod 85 to open and close the valve, the lever 84 being fulcrumed at 86. The lever 84 will preferably be included in the circuit of a battery or other source of electric energy indicated conventionally at 87.

Said circuit also preferably includes an alarm signal indicated conventionally at 88. The inner end of the rod 85 is pivoted to the lever at 90 and has a projecting portion 91 composed of electrically conductive material adapted to contact with a terminal 92 in said circuit, whereby the circuit may be closed and the signal given when the expansion of the thermostat exceeds a predetermined limit. Similarly, an undue contraction

of the thermostat may bring a terminal arm 93 into engagement with a contact piece 94 to close the circuit and operate the signal.

The opening 78 is a vent opening. This opening is preferably flanked on all sides by inwardly projecting passage walls 95, extending over the adjacent heating pipes 47 and 48 into proximity to the impeller, whereby a portion of the air thrown outwardly by centrifugal force by the impeller blades 54 will be driven through the opening 78 to the exterior without absorbing any material number of heat units from the heating pipes. The volume of air delivered through this outlet opening may be regulated manually by means of the exterior shutters or slides 96.

There are two openings 79 in the front wall member 61 and these are normally closed by interior hinged lids 100 which will be pushed to open position by a hook rod 101 when such rod is inserted to adjust a cover 102 upon a water containing humidifier pan 103. The cover 102 has an upwardly projecting flange 104 which may be engaged by the hook rod to shift the cover to its proper position. The cover 102 has a downwardly projecting flange 105, to prevent the escape of vapor from underneath it, and the humidifying capacity of the humidifier pan will, therefore, be determined by the uncovered area. The pans 103 are supported by the rods 109 and their rear walls have hook flanges 108 to engage over one of the heating pipes to prevent the pans from shifting in position when their covers are being adjusted. Water is supplied to the pans from a source of constant level supply through a pipe 111 and hose connection 111'.

The auxiliary heaters and heat controlling devices will now be described.

A set of electric heaters 110 are located in the space between the front wall member 61 and the adjacent heating pipe 47 at which point they will be in the path of the air which is being driven toward the door passages 41. These heaters are connected in parallel in a circuit which is preferably independent of that controlled by the air inlet thermostat and are manually controlled by the switch 112. The heating circuit is also automatically controlled by the electric thermostat conventionally indicated at 113 (Figure 1), this thermostat being located near the bottom of the incubating unit where it will be responsive to the temperature of the air which is about to be delivered through the egg trays. When the manually operable switch 112 is closed, the electric thermostat 113 will function to control the heaters 110 in accordance with the temperature of the air circulated about the eggs within narrower limits of maximum and minimum temperature than is possible to obtain by any control of a major heating system which circulates a heating fluid through

Above the incubator chambers and the heating chamber associated therewith, a series of superposed hatching chambers are mounted as shown in Figures 1 and 2. Each hatching chamber receives one egg tray of the same size as those in the incubating section and the door 115 in the front wall of the chamber is of a size to permit the insertion and removal of the trays. Gravity ventilation is maintained through the thermostatically controlled shutter or damper 116, which allows air to pass out of the chamber. Air is admitted through the slot 117 in the lower portion of the front wall and is directed across the humidifying pan 118 underneath a horizontal baffle wall 119, which extends inwardly from the front wall to a point near the transverse center line of the humidifying pan. Except as herein described, these hatching chambers may be constructed in any ordinary manner, and as their structural features are not claimed herein, further description is unnecessary.

During the first seventeen days of incubation, the eggs will be kept in one of the incubating chambers comprising the lower section of the unit. Each egg tray may be marked for identification and a record kept of the time of its insertion in the incubating chamber so that no attention need be paid to its position in that chamber, the temperature being constant and uniform in all portions thereof. At the end of the seventeen day period the tray will be removed from the incubating section and placed in one of the superposed hatching chambers where it will remain until the chicks have hatched. No nursery tray will be required and the hatching chambers will be made of such size as to receive and support the trays taken from the incubating section, all trays being exactly alike; and provided with egg tilting mechanism which may be applied to either the front or rear wall of the tray as set forth in the companion application which has become Patent Number 1,796,872 issued March 17, 1931. Connections for operating such egg turning mechanism are shown at the left hand of the two lower trays shown partly in section in Figure 2.

It has been found in practice that during the first seventeen days of incubation it will be advantageous to provide uniform and constant conditions of heat, moisture and air circulation, the requirement for ventilation being considerably below that required by the eggs during the last few days of incubation which has herein been termed the hatching period. During the first seventeen days the admission of fresh air is largely a matter of maintaining the oxygen supply although it is desirable to change the supply to a sufficient extent to prevent the air from becoming exhausted or foul. The expelled air and other gases

thrown outwardly by centrifugal force by the impeller blades 84 will be driven through the opening 78 to the exterior without absorbing any material number of heat units from the heating pipes. The volume of air delivered through this outlet opening may be regulated manually by means of the exterior shutters or slides 96.

There are two openings 79 in the front wall member 61 and these are normally closed by interior hinged lids 100 which will be pushed to open position by a hook rod 101 when such rod is inserted to adjust a cover 102 upon a water containing humidifier pan 103. The cover 102 has an upwardly projecting flange 104 which may be engaged by the hook rod to shift the cover to its proper position. The cover 102 has a downwardly projecting flange 105 to prevent the escape of vapor from underneath it, and the humidifying capacity of the humidifier pan will, therefore, be determined by the uncovered area. The pans 103 are supported by the rods 109 and their rear walls have hook flanges 108 to engage over one of the heating pipes to prevent the pans from shifting in position when their covers are being adjusted. Water is supplied to the pans from a source of constant level supply through a pipe 111 and hose connection 111'.

The auxiliary heaters and heat controlling devices will now be described.

A set of electric heaters 110 are located in the space between the front wall member 61 and the adjacent heating pipe 47 at which point they will be in the path of the air which is being driven toward the door passages 41. These heaters are connected in parallel in a circuit which is preferably independent of that controlled by the air inlet thermostat and are manually controlled by the switch 112. The heating circuit is also automatically controlled by the electric thermostat conventionally indicated at 113 (Figure 1), this thermostat being located near the bottom of the incubating unit where it will be responsive to the temperature of the air which is about to be delivered through the egg trays. When the manually operable switch 112 is closed, the electric thermostat 113 will function to control the heaters 110 in accordance with the temperature of the air circulated about the eggs within narrower limits of maximum and minimum temperature than is possible to obtain by any control of a major heating system which circulates a heating fluid through the pipes 47 and 48.

A lamp 114 may be included in the circuit of the heaters 110 and is preferably located in the vent passage 95 where it can be viewed through the vent opening 78. This lamp will indicate to an inspector whether the heaters are functioning. It will, of course, be understood that the heater for the major heating system will be controlled in an ordinary manner, and it is therefore not deemed necessary to illustrate or describe in detail the source of heat for the pipes 47 and 48 and the means for controlling it.

The hatching chamber portion of the unit will now be described.

through the thermostatically controlled [illegible] or damper 116, which allows air to pass out of the chamber. Air is admitted through the [illegible] 117 in the lower portion of the front wall and is directed across the humidifying pan 118 underneath a horizontal baffle wall 119, which extends inwardly from the front wall to a point near the transverse center line of the humidifying pan. Except as herein described, these hatching chambers may be constructed in any ordinary manner, and as their structural features are not claimed herein, further description is unnecessary.

During the first seventeen days of incubation the eggs will be kept in one of the incubating chambers comprising the lower section of the unit. Each egg tray may be marked for identification and a record kept of the time of its insertion in the incubating chamber so that no attention need be paid to its position in that chamber, the temperature being constant and uniform in all portions thereof. At the end of the seventeen day period the tray will be removed from the incubating section and placed in one of the superposed hatching chambers where it will remain until the chicks have hatched. No nursery tray will be required and the hatching chambers will be made of such size as to receive and support the trays taken from the incubating section, all trays being exactly alike; and provided with egg tilting mechanism which may be applied to either the front or rear wall of the tray as set forth in the companion application which has become Patent Number 1,796,872 issued March 17, 1931. Connections for operating such egg turning mechanism are shown at the left hand of the two lower trays shown partly in section in Figure 2.

It has been found in practice that during the first seventeen days of incubation it will be advantageous to provide uniform and constant conditions of heat, moisture and air circulation, the requirement for ventilation being considerably below that required by the eggs during the last [illegible] days of incubation which has herein been termed the hatching period. During the first seventeen days the admission of fresh air is largely a matter of maintaining the oxygen supply although it is desirable to change the supply to a sufficient extent to prevent the air from becoming extremely foul. The expelled air and other gases must permit a certain degree of purification, [illegible] provide space into which the fresh air may be drawn. During the hatching period [illegible] ventilation is desirable, but gravity circulation preferred to the rapidly moving air in the [illegible] of the incubating section. Rapidly moving absorbs more moisture from the shells of [illegible] than slowly moving currents and the rapidly moving currents would also tend to chill the hatched chickens by promoting rapid evaporation. It has been found that separate hatching chambers better serve the exacting requirements for proper ventilation, humidification and protection from drafts during the hatching period.

...tain a segregation of the chicks from one egg ... from those hatching in another, each hatch... chamber being arranged to receive one tray.

I claim:

1. In an incubator, the combination with an ...ubating chamber, of a heating chamber pro... with major heat radiating devices, an auxil... electrical heater provided with thermostatic ... controlling means in the incubating cham..., and power driven means for circulating air ... the main and auxiliary heating devices ...sively and distributing the heated air uni... throughout the incubating chamber, said ... driven means being arranged and adapted ... mix the air heated by both heaters prepara... to its delivery to the eggs in the incubating ...

2. In an incubator, the combination with an ...ubating chamber, of a superposed heating ..., a bottom mixing chamber in communi... with the heating chamber at the sides of ... incubating chamber and provided with means ... mixing and distributing air to the incubating ..., temperature controlled major and aux... heating devices independently operable ... the heating chamber, and power driven ... for circulating air across the major and ... heating devices successively and down... in said passages to the bottom mixing ..., said incubating chamber being adapted ... form a return passage through which air may ... in distributed condition from the mixing ... to the heating chamber.

3. In an incubator, the combination with an ...ubating chamber, of a superposed heating ..., sets of radiator pipes for circulating a ... fluid through said heating chamber, an ... mixing and directing chamber between said ... of pipes, and an air impeller within said cham... said chamber having walls apertured to admit ... the incubating chamber along the axis of ... impeller and being provided with closed ends ... sides open along said pipes, whereby the im... may churn and circulate air across the ..., the walls of said incubator having passages ... to receive such air and convey it to the ... of the incubating chamber, and means for ... the air upwardly through and with ...tial uniformity in all portions of the incu... chamber to the suction side of the impeller.

4. In an incubator, the combination with an ... chamber, of major heat radiating de... a radiator for circulating heating ... temperature controlled independently op... auxiliary heater, power driven means for ... and circulating air across the major and ... heating devices and through the incu..., means for delivering air from one ... the incubating chamber to one side of ... in which the impeller revolves, and from ...tion of the incubating chamber to an... of the impeller, whereby to promote ... driven air mixing and distributing device in the path of such air at the opposite side of the incubating chamber from that at which the air forcing means is located, said mixing and distributing device being formed to intercept, break up, and laterally distribute currents of air moving from the air moving device, whereby such air may flow through the incubating portion of the chamber relieved of its momentum energy.

6. In an incubator, the combination with an incubating chamber having front doors and rear walls provided with vertically extending passages communicating with space above and below said chamber, a major heating system having a radiator for circulatory heating fluid in the space above said chamber, auxiliary temperature controlled electrical heaters, and means for churning and moving air from the central portion of said space across said radiator and electrical heater and downwardly through the door and rear wall passages to the space underneath the incubating chamber, said incubating chamber being formed to constitute a return passage through which air may pass in distributed form upwardly to the receiving side of the air forcing means.

7. In an incubator, the combination with an incubating chamber having front doors and rear walls provided with vertically extending passages communicating with space above and below said chamber, sets of radiator pipes in the space above said chamber, auxiliary temperature controlled electrical heaters and means for churning and forcing air from the central portion of said space across said pipes and electrical heater and downwardly through the door and rear wall passages to the space underneath the incubating chamber, said incubating chamber being formed to constitute a return passage through which air may pass in distributed form upwardly to the receiving side of the air moving means, together with co-operative means for humidifying the circulating air and thoroughly mixing all portions of such air before delivering it to the incubating chamber.

8. In an incubator, the combination with an incubating chamber, radiator pipes and electrical heaters disposed above said chamber, temperature controlled means for admitting air from the exterior for co-operative heating control, independently operable temperature controlled means for opening and closing the circuit of the electrical heaters, and means for mixing and circulating air across the radiator pipes and electrical heaters and distributing it through the incubating chamber for a uniform heating of all portions thereof, said circulating means including an air receiving housing provided with inlets in its top and bottom walls, a power driven rotary impeller having its central portions disposed to receive air from said inlets and adapted to move such air outwardly centrifugally, said housing having end walls against which said air may be

...sively and distributing the heated air uni... throughout the incubating chamber, said ... driven means being arranged and adapted ... the air heated by both heaters prepara... to its delivery to the eggs in the incubating ...ber.

... In an incubator, the combination with an ...ating chamber, of a superposed heating ...ber, a bottom mixing chamber in communi... with the heating chamber at the sides of ... incubating chamber and provided with means ... mixing and distributing air to the incubating ...ber, temperature controlled major and aux... heating devices independently operable ... the heating chamber, and power driven ... for circulating air across the major and ... heating devices successively and down... in said passages to the bottom mixing ...ber, said incubating chamber being adapted ... form a return passage through which air may ... in distributed condition from the mixing ...ber to the heating chamber.

... In an incubator, the combination with an ...ating chamber, of a superposed heating ...ber, sets of radiator pipes for circulating a ... fluid through said heating chamber, an ... mixing and directing chamber between said ... of pipes, and an air impeller within said cham... said chamber having walls apertured to admit ... from the incubating chamber along the axis of ... impeller and being provided with closed ends ... sides open along said pipes, whereby the im... may churn and circulate air across the ..., the walls of said incubator having passages ... to receive such air and convey it to the ... of the incubating chamber, and means for ...ting the air upwardly through and with ...tial uniformity in all portions of the incu... chamber to the suction side of the impeller.

... In an incubator, the combination with an ...ting chamber, of major heat radiating de... including a radiator for circulating heating ... a temperature controlled independently op... auxiliary heater, power driven means for ... and circulating air across the major and ... heating devices and through the incu... chamber, means for delivering air from one ... of the incubating chamber to one side of ... in which the impeller revolves, and from ... portion of the incubating chamber to an... ... of the impeller, whereby to promote ... and distribution of the air flowing ... the incubating chamber.

... In an incubator, the combination with a ... chamber and an incubating chamber, of ... circulating, major heat radiating devices, ... controlled, relatively sensitive, in... responsive and independently operable ... heating devices, power driven means lo... in the heating chamber adjacent the heat ... and auxiliary heating device and adapt... for ... and forcing air across the major and ... heating devices successively and thence ... the incubating chamber from an opposite ..., together with a co-operating power walls provided with vertically extending passages communicating with space above and below said chamber, a major heating system having a radiator for circulatory heating fluid in the space above said chamber, auxiliary temperature controlled electrical heaters, and means for churning and moving air from the central portion of said space across said radiator and electrical heater and downwardly through the door and rear wall passages to the space underneath the incubating chamber, said incubating chamber being formed to constitute a return passage through which air may pass in distributed form upwardly to the receiving side of the air forcing means.

7. In an incubator, the combination with an incubating chamber having front doors and rear walls provided with vertically extending passages communicating with space above and below said chamber, sets of radiator pipes in the space above said chamber, auxiliary temperature controlled electrical heaters and means for churning and forcing air from the central portion of said space across said pipes and electrical heater and downwardly through the door and rear wall passages to the space underneath the incubating chamber, said incubating chamber being formed to constitute a return passage through which air may pass in distributed form upwardly to the receiving side of the air moving means, together with co-operative means for humidifying the circulating air and thoroughly mixing all portions of such air before delivering it to the incubating chamber.

8. In an incubator, the combination with an incubating chamber, radiator pipes and electrical heaters disposed above said chamber, temperature controlled means for admitting air from the exterior for co-operative heating control, independently operable temperature controlled means for opening and closing the circuit of the electrical heaters, and means for mixing and circulating air across the radiator pipes and electrical heaters and distributing it through the incubating chamber for a uniform heating of all portions thereof; said circulating means including an air receiving housing provided with inlets in its top and bottom walls, a power driven rotary impeller having its central portions disposed to receive air from said inlets and adapted to move such air outwardly centrifugally, said housing having end walls against which said air may be moved and churned, and outlet openings to deliver it in the direction of the pipes and electrical heaters, preparatory to its delivery to the incubating chamber.

9. In an incubator, the combination with an incubating chamber having space above its egg receiving portion subdivided to provide passages for ascending currents of air in the ends of said space and descending currents of air at the sides thereof, independently operable heating elements in the side portion of said space, and an intermediate power driven impeller for circulating air, said subdivision being adapted to direct air from

the incubating chamber through said end passages to the upper side of the impeller and to direct additional air to the underside thereof from other portions of the incubating chamber, said impeller having a horizontally disposed central web adapted to separate the air received from above from that received from below, and means for delivering the downwardly moving air currents to the bottom portions of the incubating chamber.

10. In an incubator, the combination with an incubating chamber, forming an upward passage for air and flanked on two sides with downward passages leading to space underneath the incubating chamber, of an impeller chamber above the incubating chamber, closed at its ends and having centrally apertured top and bottom walls and open sides, the apertures in the top and bottom walls being respectively in communication with opposite side portions of the incubating chamber, and the open sides being in registry with said downward passages, and an air impelling rotary device in the impeller chamber and disposed for rotation in a horizontal plane.

11. In an incubator provided with a heater dependent upon the combustion of fuel, the combination of an incubating chamber and a heating chamber provided with heat radiating devices connected with said source of heat supply, an auxiliary electrical heater, thermostatic means for controlling the current supply to said electrical heater, and power driven means for mechanically circulating air through said chambers and for mixing air coming from the respective heaters preparatory to its delivery to the incubating portion of the incubating chamber, said air mixing device being formed to break up air currents, to laterally distribute the air in a manner to maintain a differential pressure throughout the incubating portion of the chamber between the inlet and the outlet sides thereof, and to regulate the flow of air over the eggs in accordance with such differential pressure, substantially relieved of momentum effects which would otherwise tend to prevent such distribution.

12. In an incubator the combination with an incubating chamber, of an exterior chamber provided with an impelling device adapted to deliver sheets of air into the incubating chamber from opposite sides of one end portion and to withdraw air from other sides of the opposite end portion, and momentum checking, air distributing power driven means located substantially at the meeting line of the inlet currents, and adapted to drive the air laterally and interrupt propulsion along the line of circulation, whereby the air will be caused to flow through the incubating chamber by reason of differential pressure at the inlet and outlet ends thereof, independently of its velocity at the inlets.

13. In an incubator provided with an incubating chamber having inlets and outlets at its respective end portions and an exterior heating chamber provided with humidifying and circulating means adapted to withdraw air through said outlets and return it through the inlets, and co-operating power driven means adjacent the said inlets for breaking up the air currents, distributing the air laterally, and allowing it to flow through the portions of the incubating chamber under differential pressures between the inlet and outlet ends, and sets of horizontally disposed egg trays filling the intermediate space and tending to preserve said lateral distribution, said circulating means being provided with a central web and suction inlets at opposite sides of said web to equalise the suction at the outlets of the incubating chamber.

14. An incubator unit adapted for assembly with other units in a series having a common source of heat supply, said unit comprising a heating chamber and a pair of egg chambers partially separated by a central partition, and provided with hollow front and rear walls having slot-like openings at top and bottom affording communication between the heating chamber and the bottom of each egg chamber, humidifying pans in the heating chamber and power driven means for churning the air across the humidifying pans and heating devices, said churning means being adapted to move air downwardly in the front and rear wall passages, and into the heating chamber with equalised suction from other sides of the top portion of the incubating chamber.

GEORGE T. MARKEY.

chamber.

10. In an incubator, the combination with an incubating chamber, forming an upward passage for air and flanked on two sides with downward passages leading to space underneath the incubating chamber, of an impeller chamber above the incubating chamber, closed at its ends and having centrally apertured top and bottom walls and open sides, the apertures in the top and bottom walls being respectively in communication with opposite side portions of the incubating chamber, and the open sides being in registry with said downward passages, and an air impelling rotary device in the impeller chamber and disposed for rotation in a horizontal plane.

11. In an incubator provided with a heater dependent upon the combustion of fuel, the combination of an incubating chamber and a heating chamber provided with heat radiating devices connected with said source of heat supply, an auxiliary electrical heater, thermostatic means for controlling the current supply to said electrical heater, and power driven means for mechanically circulating air through said chambers and for mixing air coming from the respective heaters preparatory to its delivery to the incubating portion of the incubating chamber, said air mixing device being formed to break up air currents, to laterally distribute the air in a manner to maintain a differential pressure throughout the incubating portion of the chamber between the inlet and the outlet sides thereof, and to regulate the flow of air over the eggs in accordance with such differential pressure, substantially relieved of momentum effects which would otherwise tend to prevent such distribution.

12. In an incubator the combination with an incubating chamber, of an exterior chamber provided with an impelling device adapted to deliver by reason of differential pressure [illegible] outlet ends thereof, independently of its velocity at the inlets.

13. In an incubator provided with an incubating chamber having inlets and outlets at its respective end portions and an exterior heating chamber provided with humidifying and circulating means adapted to withdraw air through said outlets and return it through the inlets, and co-operating power driven means adjacent the said inlets for breaking up the air currents, distributing the air laterally, and allowing it to flow through the portions of the incubating chamber under differential pressures between the inlet and outlet ends, and sets of horizontally disposed egg trays filling the intermediate space and tending to preserve said lateral distribution, said circulating means being provided with a central web and suction inlets at opposite sides of said web to equalize the suction at the outlets of the incubating chamber.

14. An incubator unit adapted for assembly with other units in a series having a common source of heat supply, said unit comprising a heating chamber and a pair of egg chambers partially separated by a central partition, and provided with hollow front and rear walls having slot-like openings at top and bottom affording communication between the heating chamber and the bottom of each egg chamber, humidifying pans in the heating chamber and power driven means for churning the air across the humidifying pans and heating devices, said churning means being adapted to move air downwardly in the front and rear wall passages, and into the heating chamber with equalized suction from other sides of the top portion of the incubating chamber.

GEORGE T. MARKEY.

Defendants' Exhibit No. 51.

	James	Smith
Discharged Air	5,880 Heat Units (B.T.U.'s)	3,440 Heat Units (B.T.U.'s)
Egg Heat at Top of Column	1,275 B.T.U.'s	3,575 B.T.U.'s
NO Egg Heat Returned in James		+ 135 B.T.U.'s

Egg Heat Returned in Smith towards the bottom of the egg column for more use.

Based on Taggart's Heat Chart Per Plaintiff's Exhibit No. 3

DEFENDANT'S EXHIBIT No. 54

DEFENDANT S' EXHIBIT No. 55 A

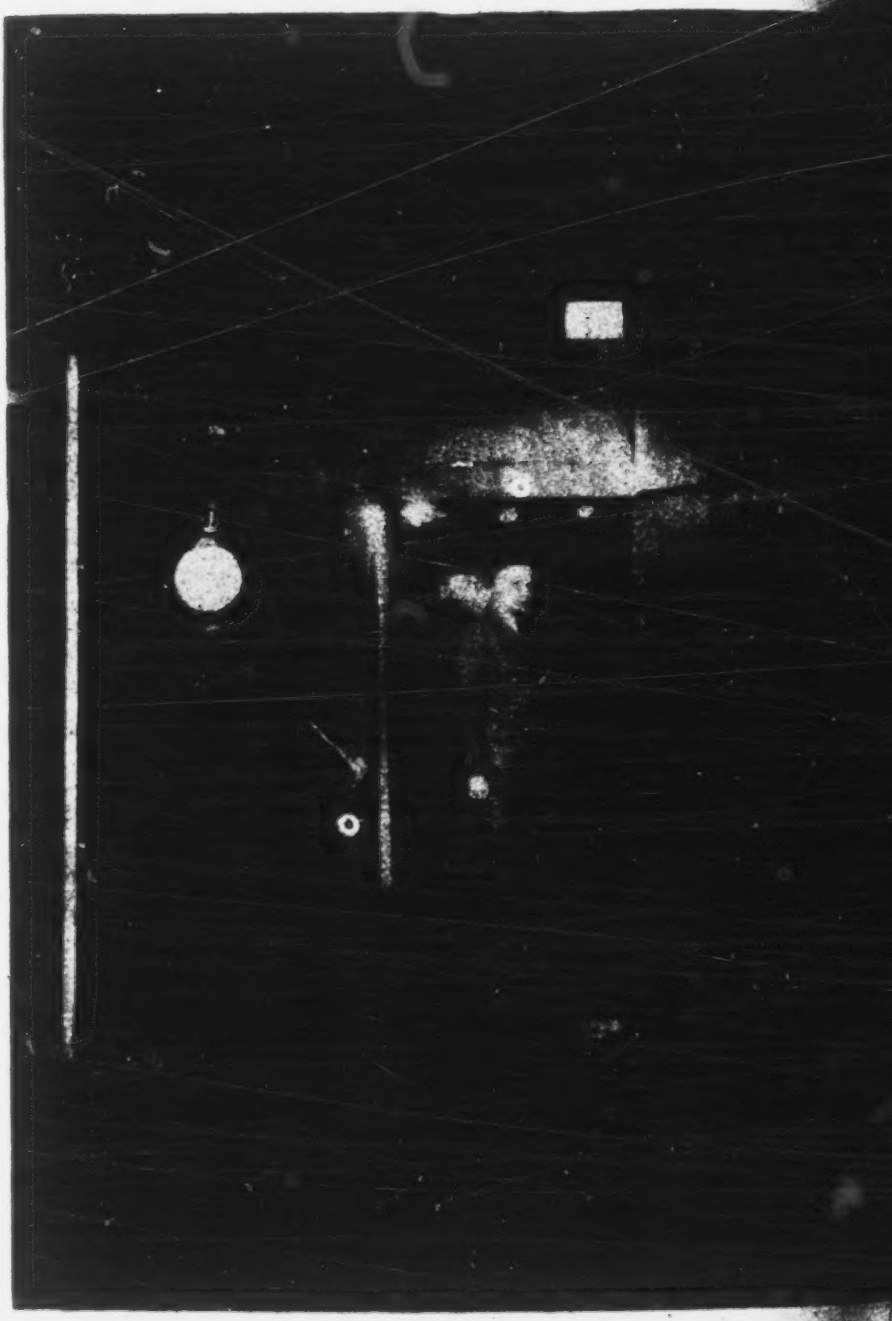
1179

DEFENDANT'S EXHIBIT No. 55 B

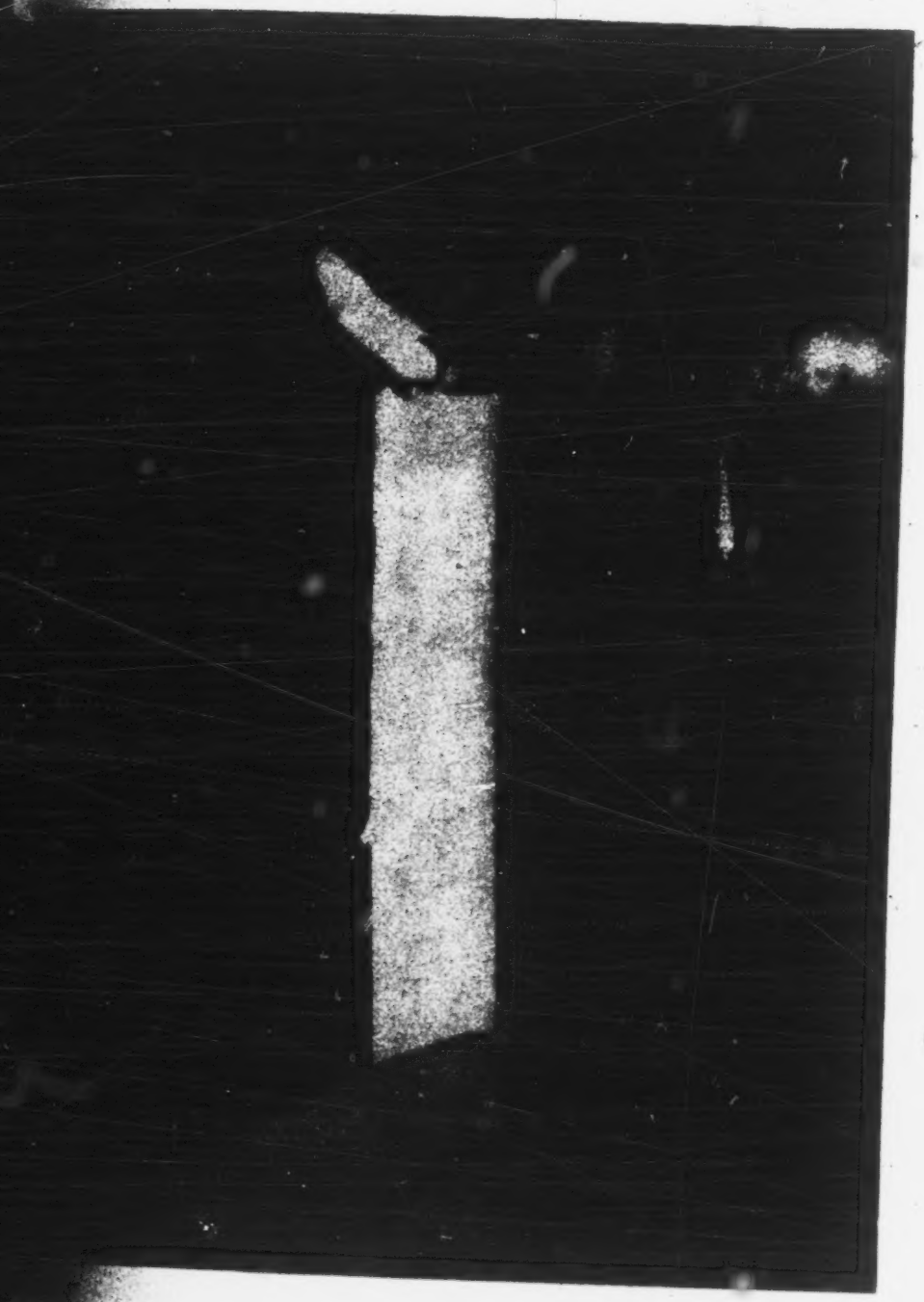
1474

DEFENDANT S' EXHIBIT No. 55 C

DEFENDANT'S EXHIBIT No. 55 D

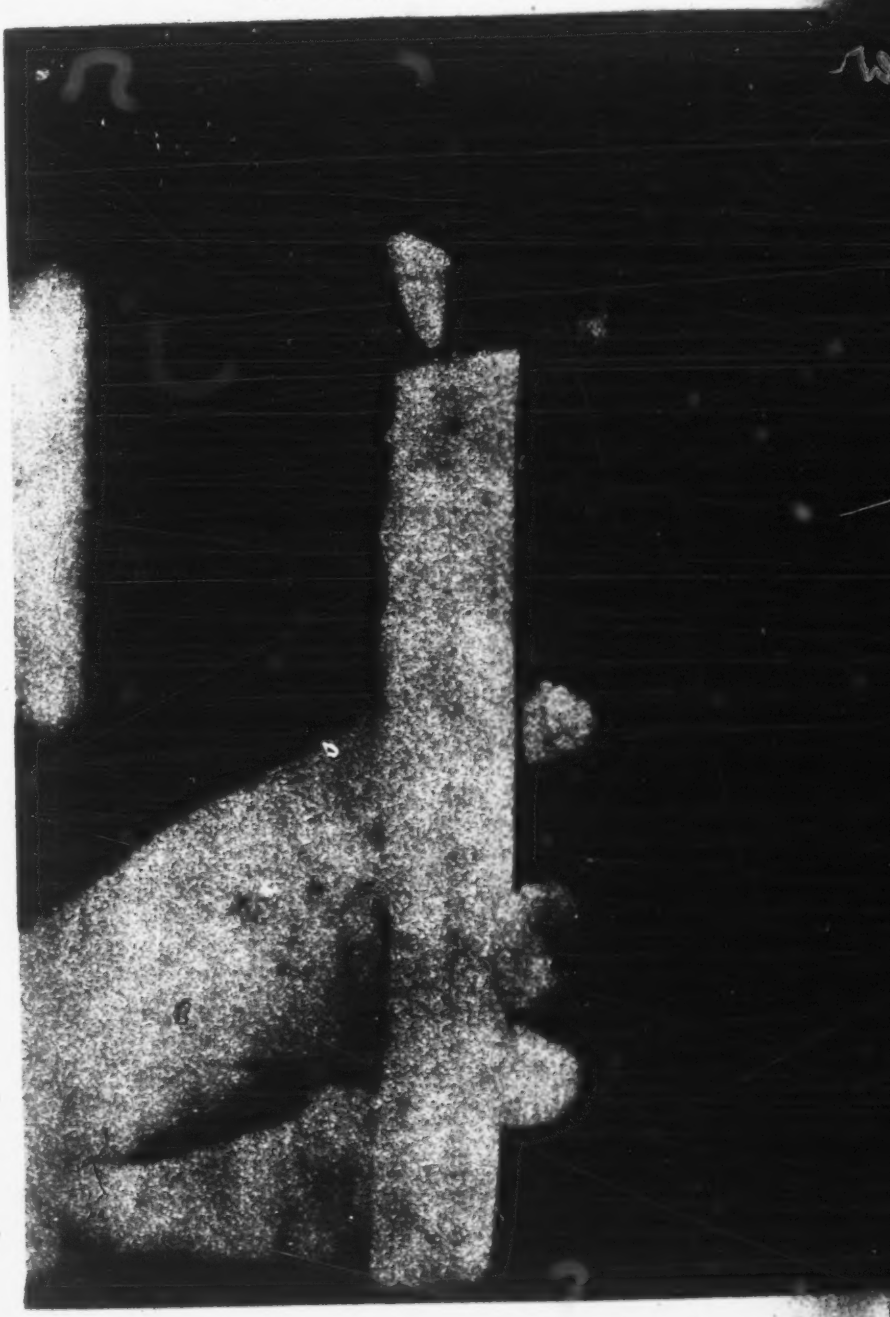


DEFENDANT 5' EXHIBIT No. 56 A



1183

DEFENDANT'S EXHIBIT No. 56-B



1478

DEFENDANT S' EXHIBIT No. 56 C

1184

1479

DEFENDANT'S EXHIBIT No. 57 A

DEFENDANT S' EXHIBIT No. 57 B

1186

1481

1187

DEFENDANT'S EXHIBIT No. 57 C

1482

DEFENDANT 8' EXHIBIT No. 58

PROCTOR

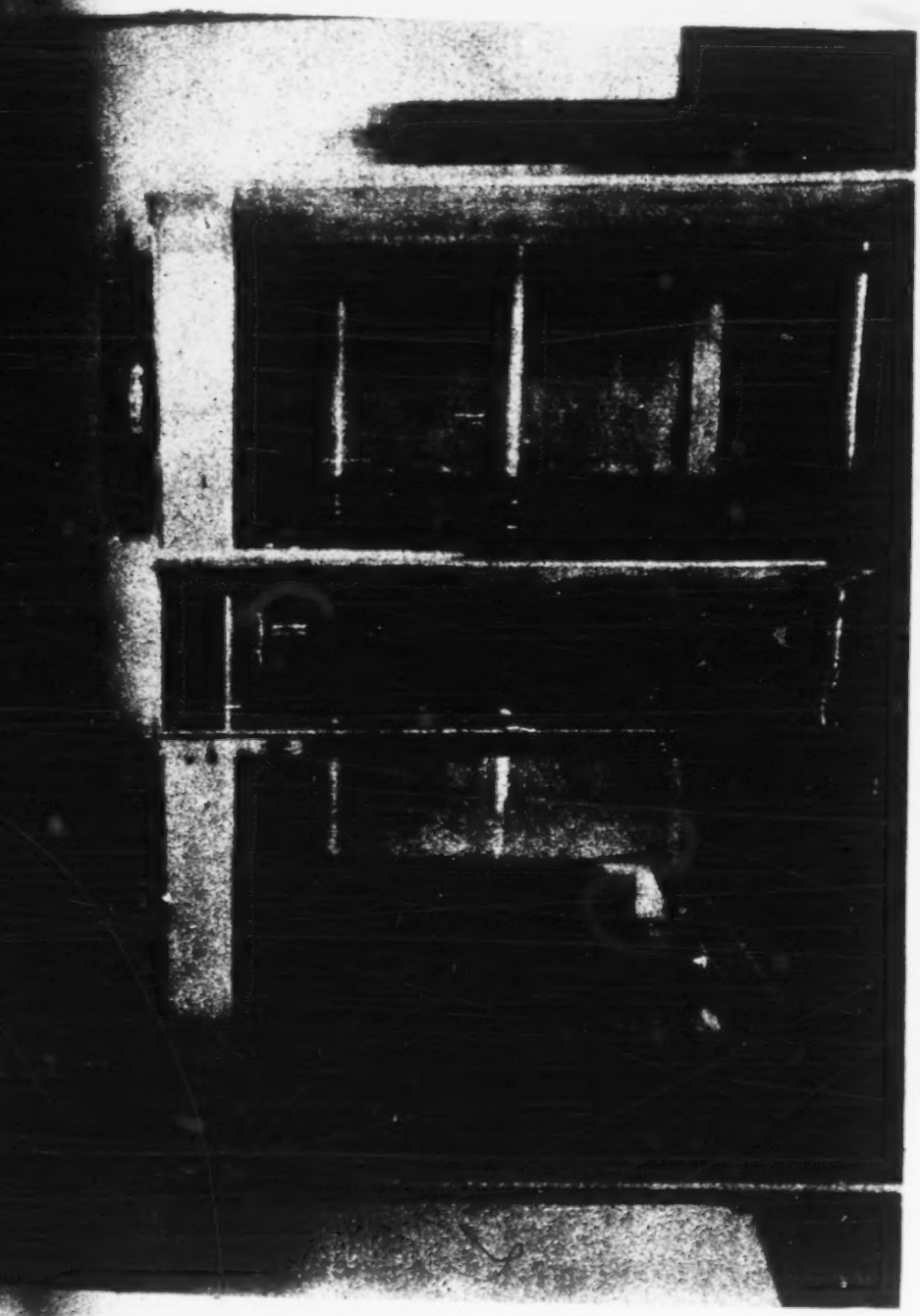
DEFENDANT S' EXHIBIT No. 58

1194

SCHWARTZ

1489

1490



1197

1492

DEFENDANT S' EXHIBIT No. 58

GOLDSTEIN

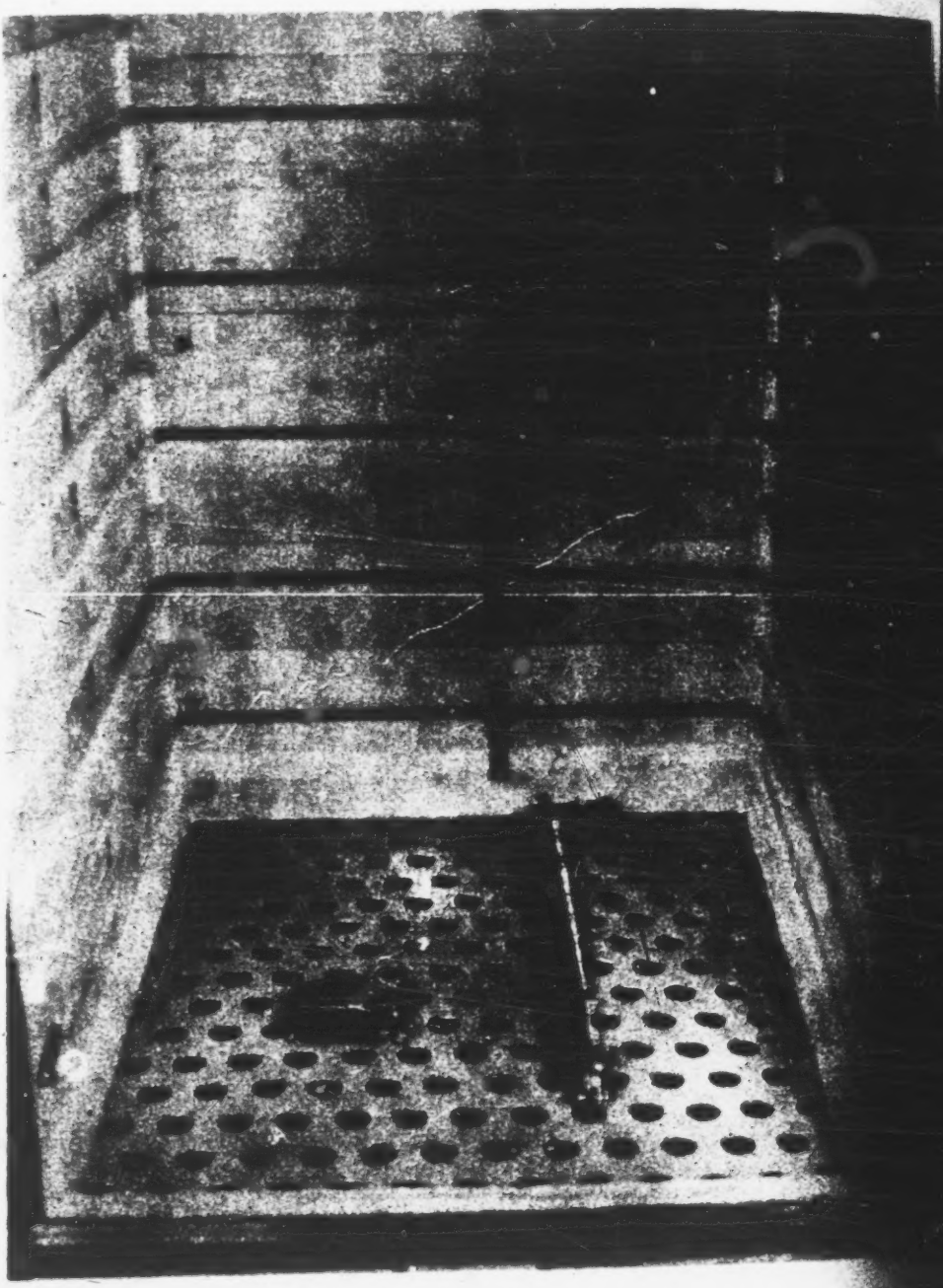
1201

1496

1203

1498

1203



1498

1205

1500

1207

1502

DEFENDANT S' EXHIBIT No. 58 1208

STULIK

1503

1209

1504

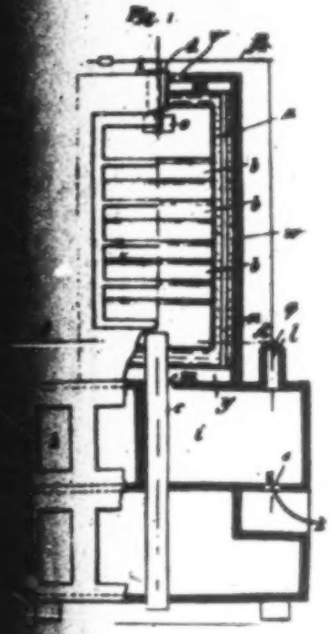
1505

1506

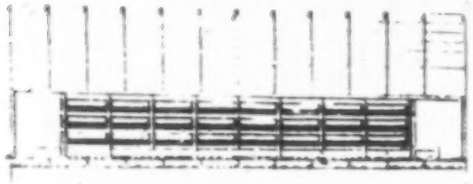
1507

DEFENDANT S' EXHIBIT No. 59

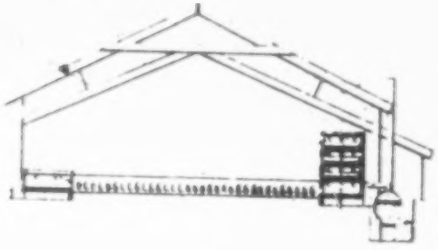
No. 1
STULIK
GERMAN PATENT 155,917
NOVEMBER 11, 1904
INCUBATOR



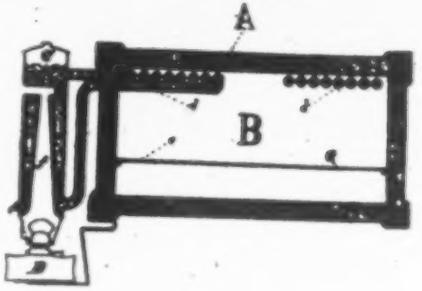
No. 2
GUERIN
3019 MARCH 30, 1843
EGG HATCHING APPARATUS



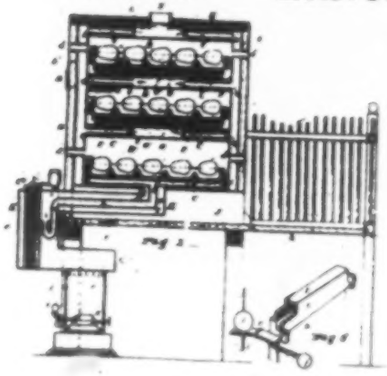
No. 3
GUERIN
3019 MARCH 30, 1843
EGG HATCHING APPARATUS



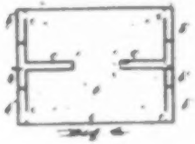
No. 4
CYPHERS
330,163 DECEMBER 4, 1884
INCUBATOR



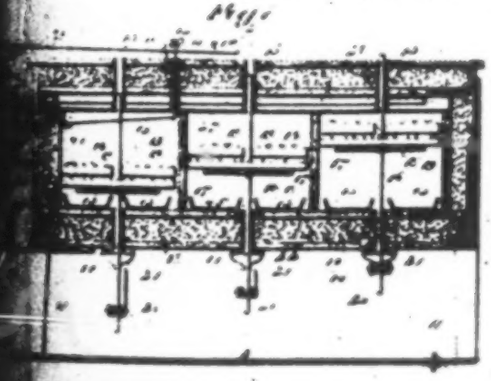
No. 5
MESCHTER 347,946
INCUBATOR AUGUST 24, 1886



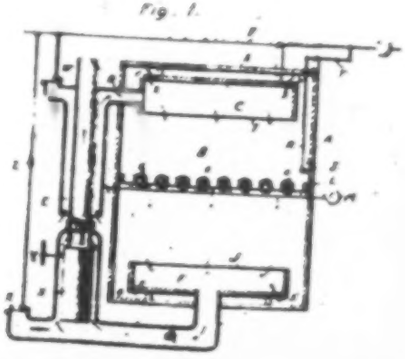
No. 6
MESCHTER
347,946 AUGUST 24, 1886
INCUBATOR



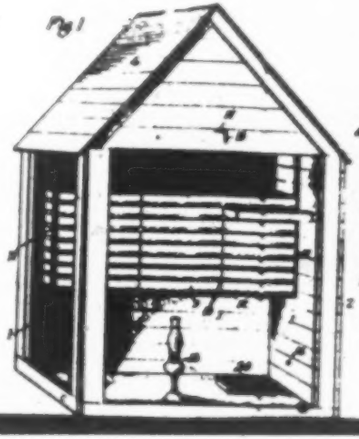
No. 7
N. HASSLAM
INCUBATOR.
No. 548,107. Patented May 28, 1895.



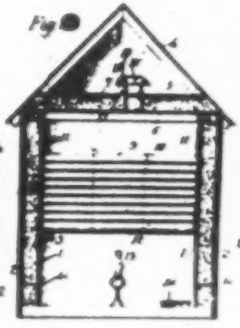
No. 8
G. T. WOODS
INCUBATOR
Patented Aug. 29, 1899



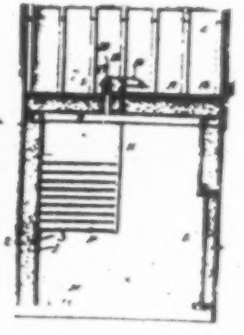
No. 9



No. 10
BELL
691,837 JAN. 28, 1902
INCUBATOR

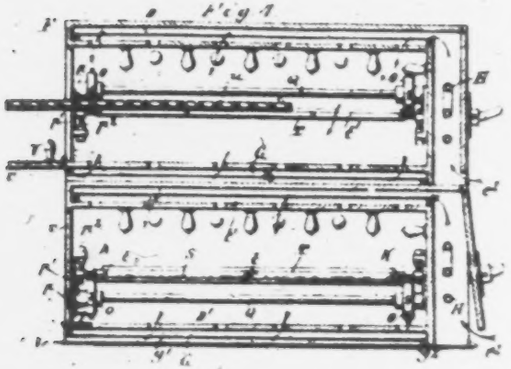


No. 11
BELL
691,837 JAN. 28, 1902
INCUBATOR

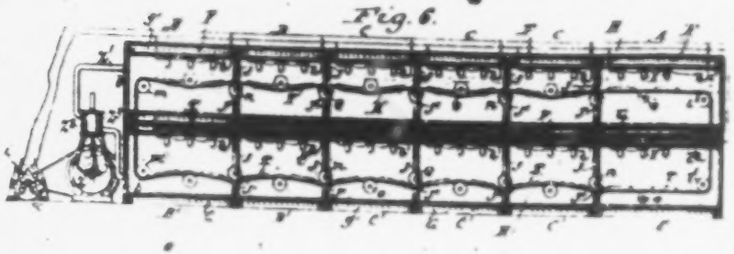


1508

No. 12
PERKINS
798,697 SEPT. 5, 1905
INCUBATOR

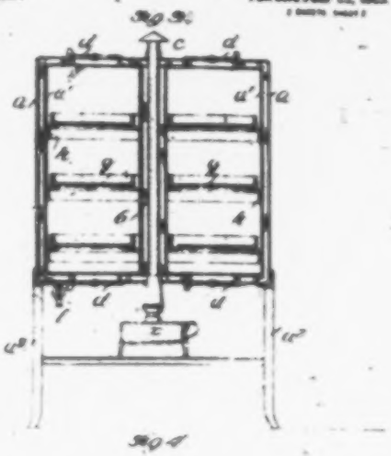


No. 13
PERKINS
798,697 SEP'T. 5, 1905
INCUBATOR



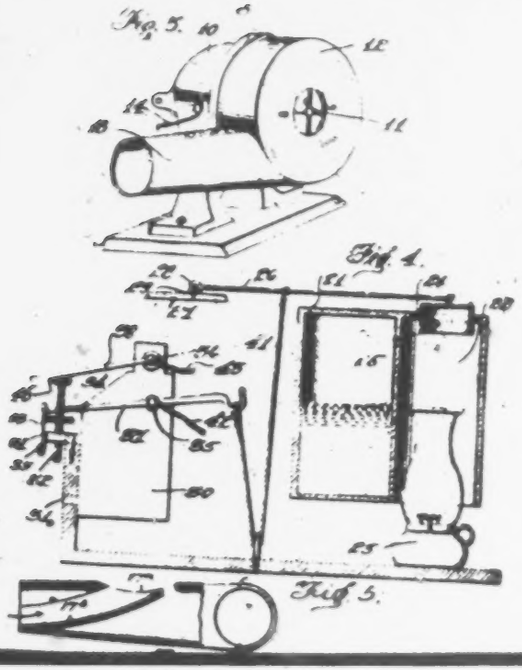
No. 14 DEF. Ex 59 page 8

1,144,938.



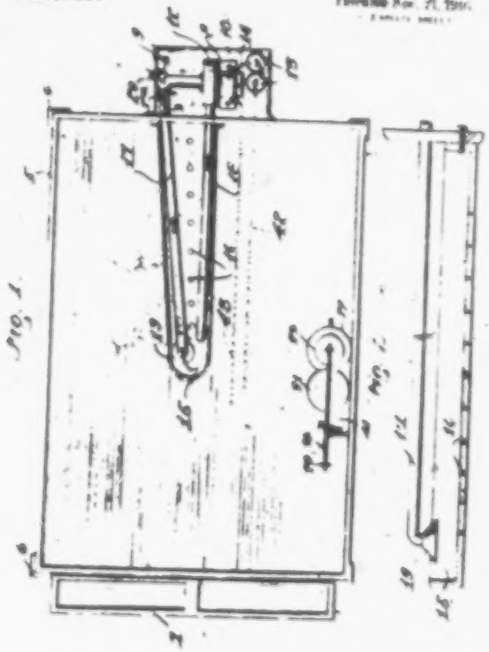
No. 15

1,906,445.



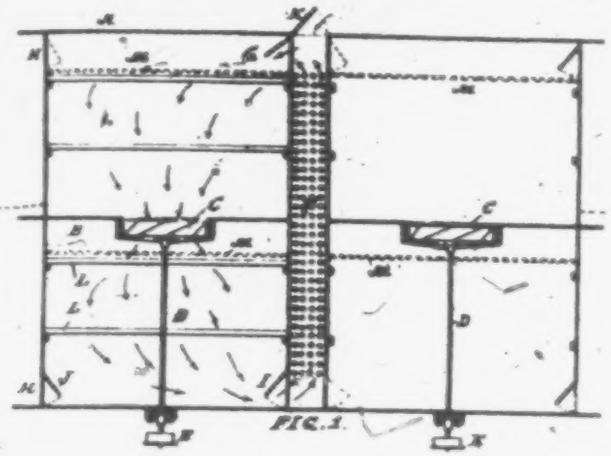
No. 16

906,445.



No. 17
GARDNER
BRITISH PATENT 10,288
1887

No. 18
PROCTOR & KNOWLES
432,282 JULY 15, 1890
DRYING MACHINE



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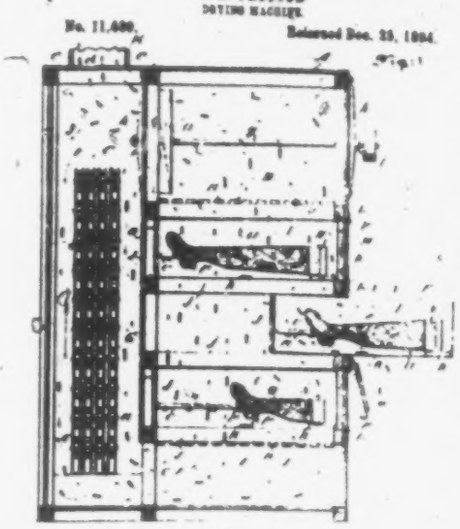
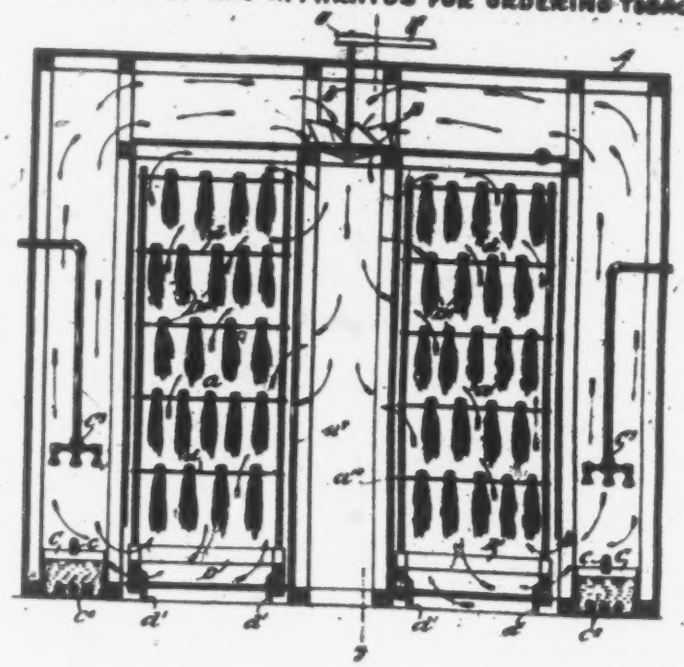
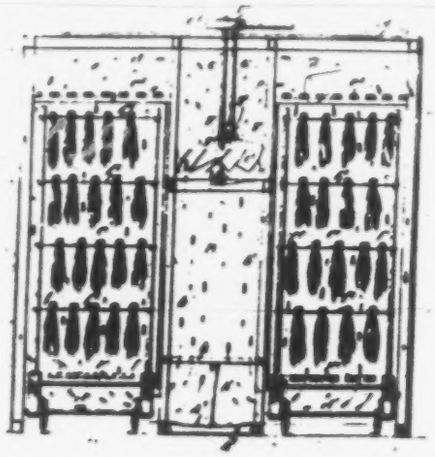


1509
Def. Ex. 59
No. 20
SCHWARTZ
535,175 MARCH 5, 1895
METHOD OF AND APPARATUS FOR ORDERING TOBACCO

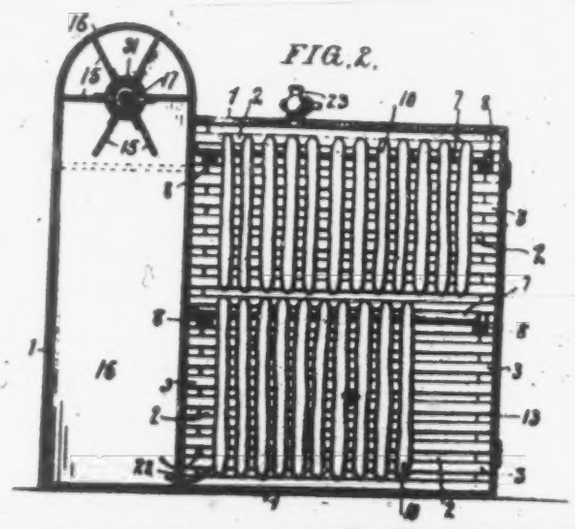


No. 21

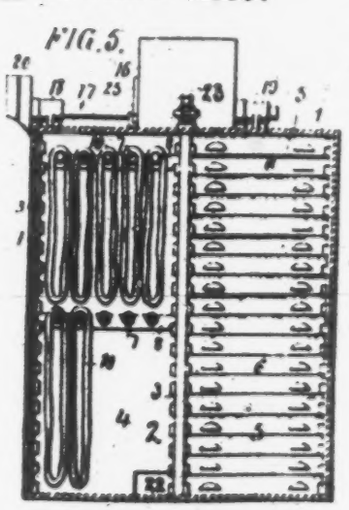
No. 22



No. 23
VERNA
891,019 JUNE 16, 1908
DRYING ROOM



No. 24
VERNA
891,019 JUNE 16, 1908
DRYING ROOM



1510 1215

DEF. EX. 59
PAGE 4

No. 25

T. S. FREAS.

HEATING SYSTEM FOR CONSTANT TEMPERATURE BATHS.

APPLICATION FILED DEC. 12, 1913.

1,165,958.

Patented Dec. 28, 1915.

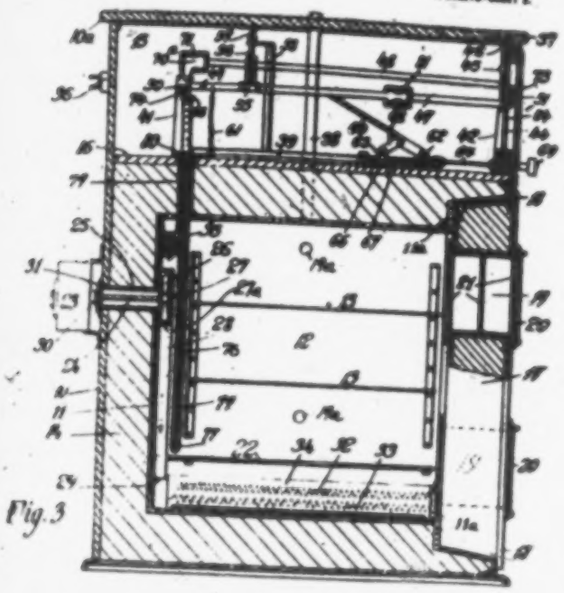


Fig. 3

No. 26

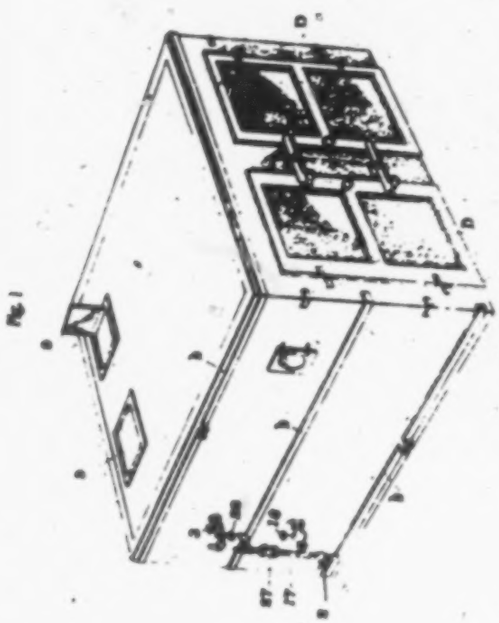
J. SCHMIDT & E. SCHÜTTERLE.

APPARATUS FOR DRYING MACARONI AND LIKE BAKERY PRODUCTS.

APPLICATION FILED JUNE 5, 1911.

1,010,809.

Patented Dec. 5, 1911.



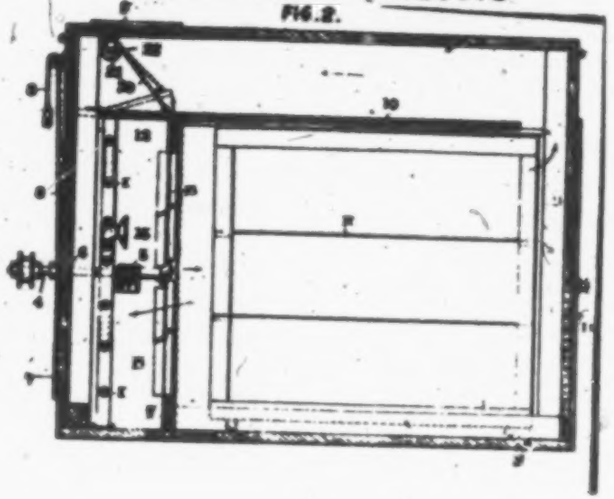
No. 27

SCHMIDT & SCHÜTTERLE

1,010,809 DEC. 5, 1911

APPARATUS FOR DRYING MACARONI AND LIKE BAKERY PRODUCTS

FIG. 2.



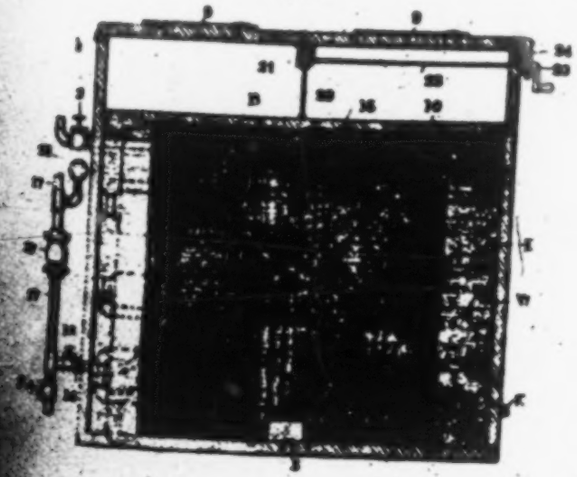
No. 28

SCHMIDT & SCHÜTTERLE

1,010,809 DEC. 5, 1911

APPARATUS FOR DRYING MACARONI AND LIKE BAKERY PRODUCTS

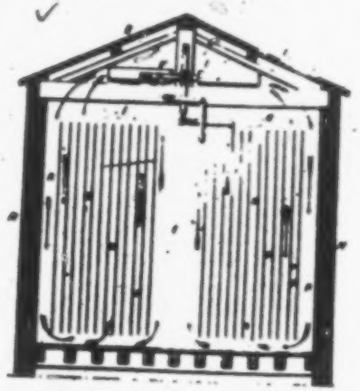
Fig. 1



No. 29.

S. LUKE.

Patented July 1913



No. 30.

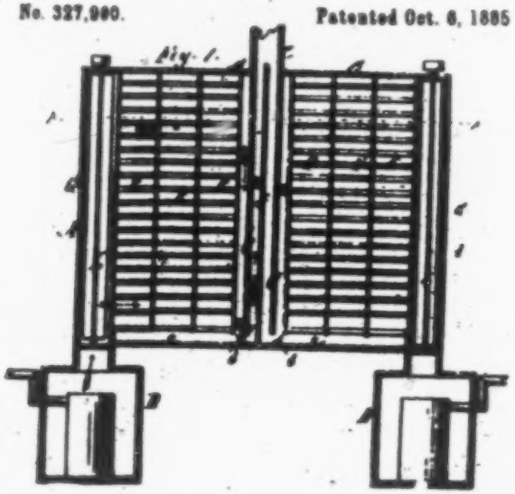
(No Model.)

W. H. ROGERS.

DRIER.

No. 327,980. Patented Oct. 6, 1885

Fig. 1.



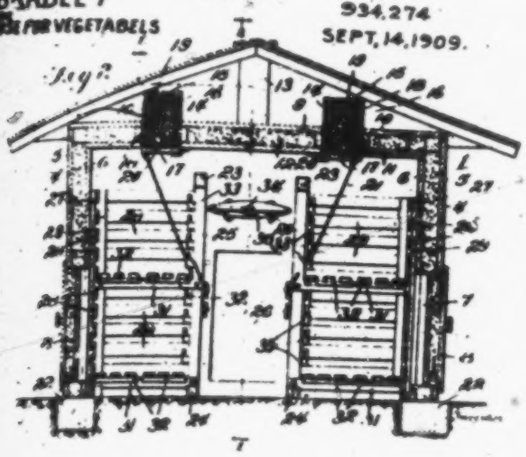
1511

No. 31

BRADLEY

934,274

SEPT. 14, 1909.



No. 32

G. E. GOLDSTEIN.

1,187,752.

Patented May 4, 1915.

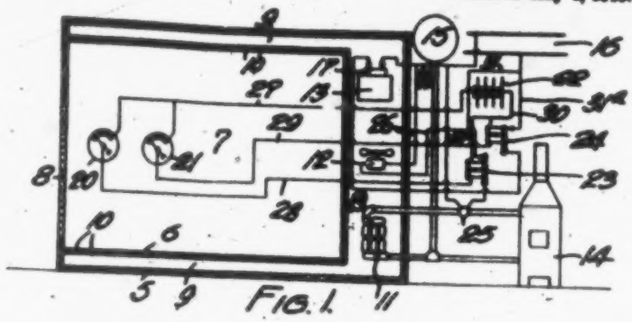


FIG. 1.

NO. 33 GOLDSTEIN

O.G. E.X. 59 page 8

1,137,752

MAY 4, 1915

APPARATUS FOR CURING OR ARTIFICIALLY AGING CIGARS

APPLICATION FILED JUNE 20, 1914

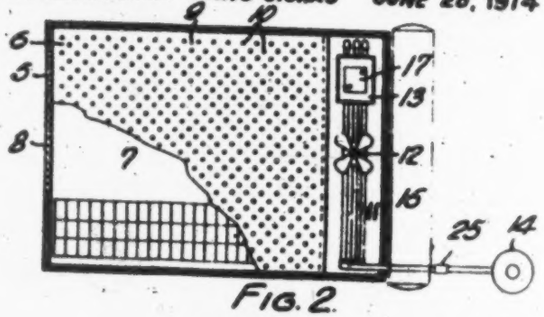


FIG. 2.

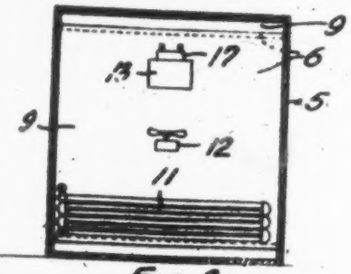


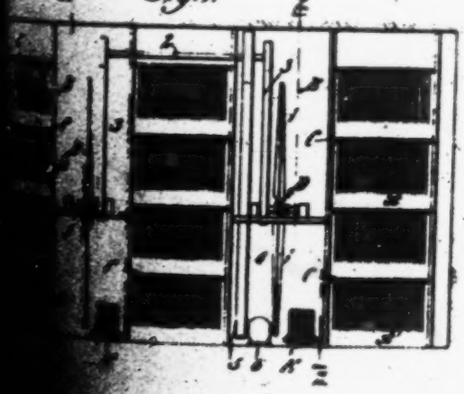
FIG. 3.

No. 34

S. VIVIANO

Patented July 2, 1918

Fig. 1.



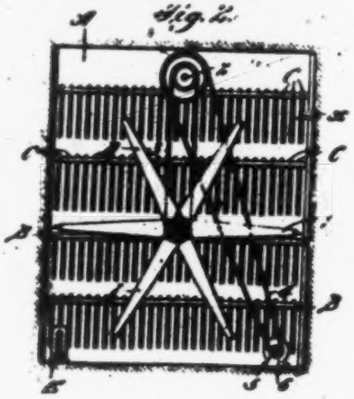
No. 35

VIVIANO

1,270,800 JULY 2, 1918

APPARATUS FOR DRYING MACARONI, SPAGHETTI AND SIMILAR FOODS

Fig. 2.



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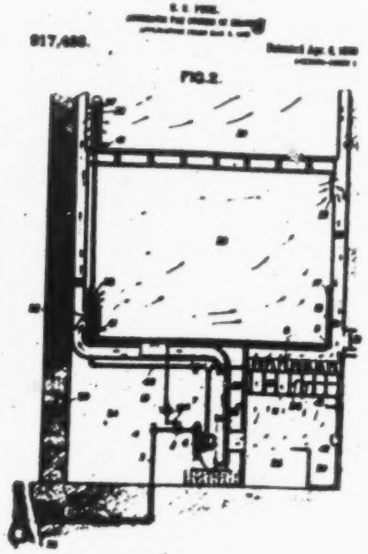


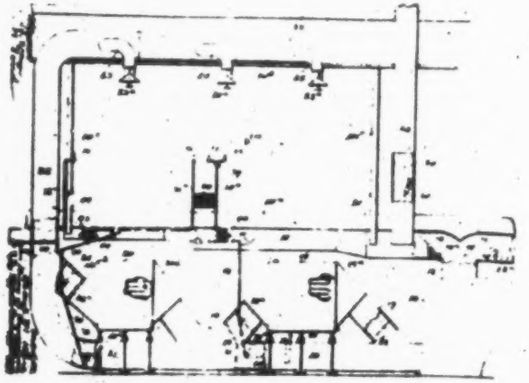
No. 37

PETERS ET AL.

843,909

FEB. 12, 1907

ATMOSPHERE REGULATING SYSTEM



1512

Def. Ex. 59 page 6

No. 38

T. B. FREAS.

HEATING SYSTEM FOR CONSTANT TEMPERATURE BATHS.

APPLICATION FILED MAR. 17, 1913.

1,165,958.

Patented Dec. 28, 1915.

4 SHEETS—SHEET 2.

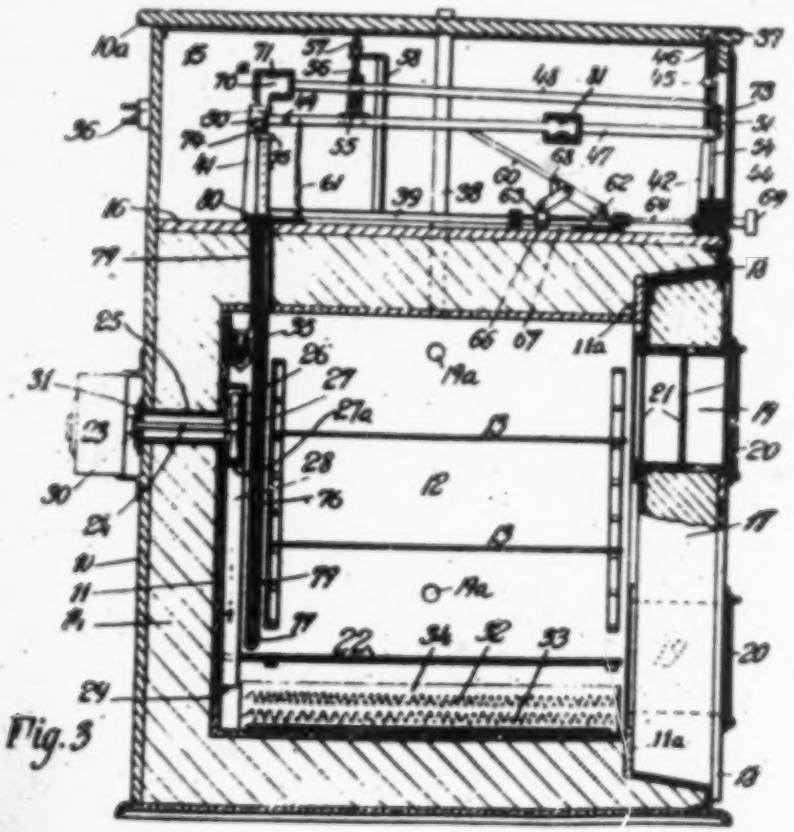
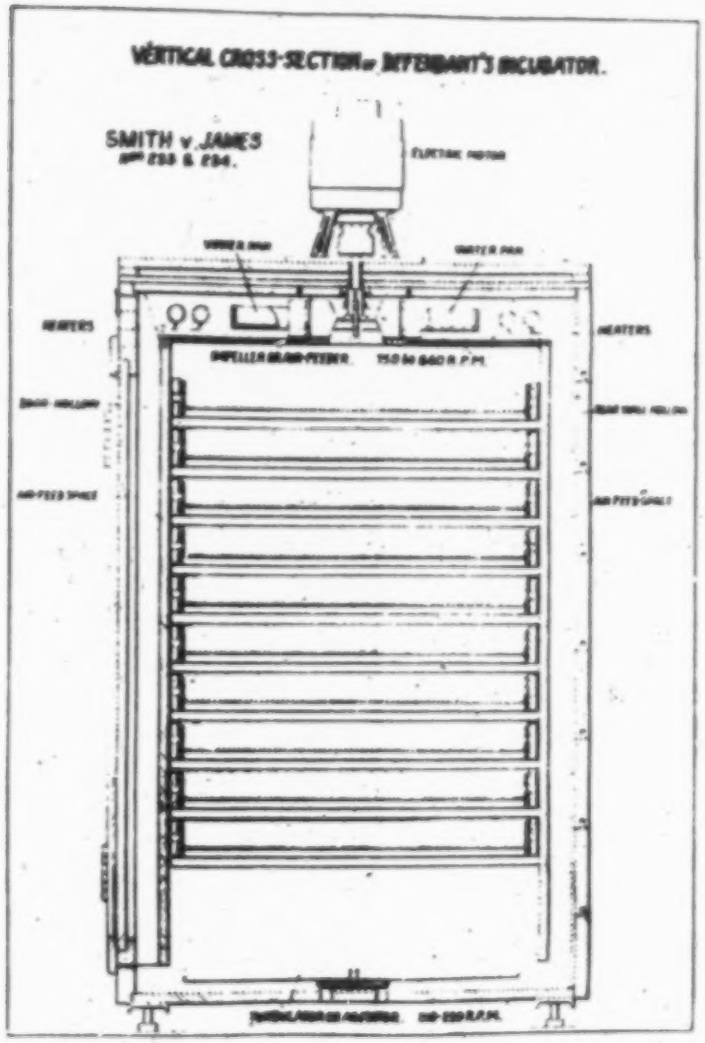


Fig. 3

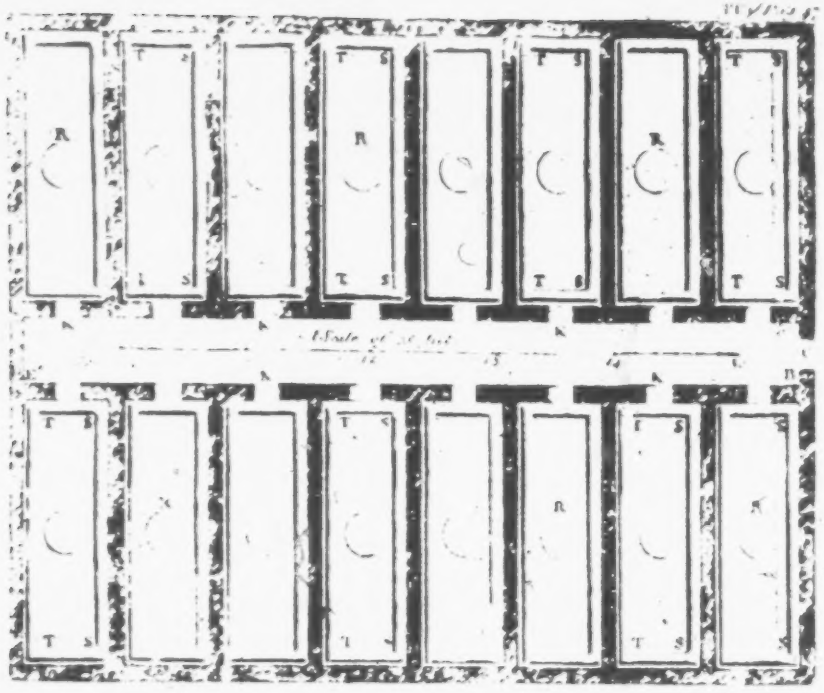
No. 39



1513
DEF. EX. 69
page 7

FROM THE ART
OF
HATCHING AND BRINGING UP DOMESTIC FOWLS &c.
BY DE REAUMUR 1750

No. 40



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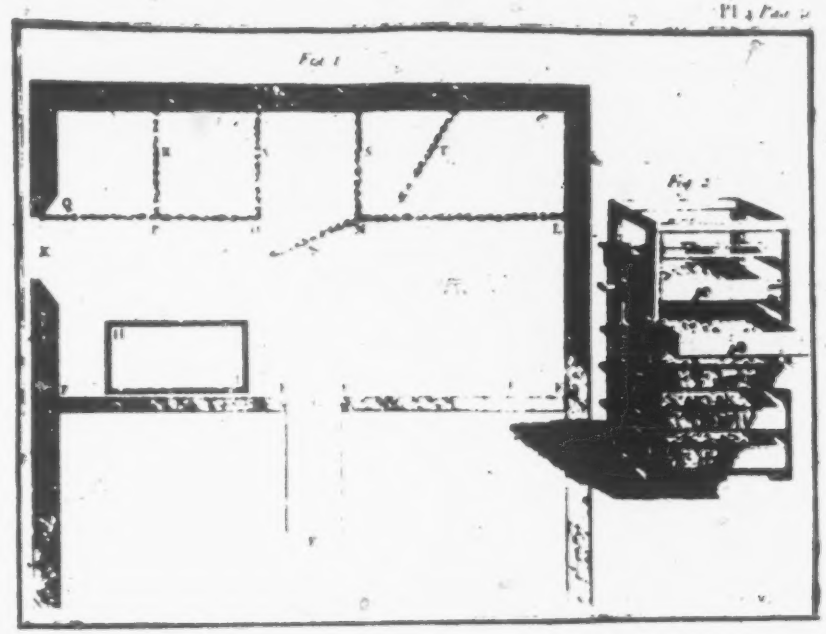
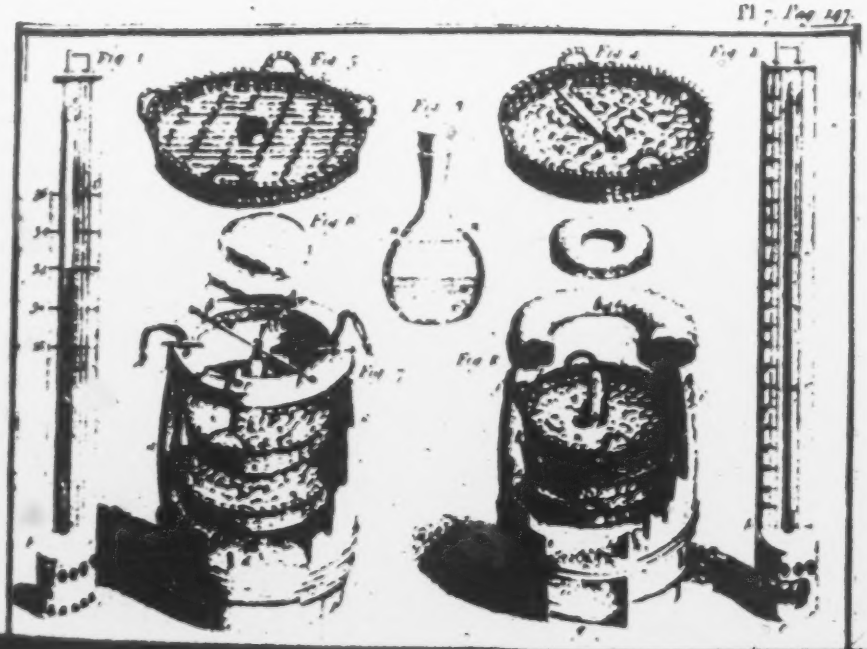


No. 42
PAGE 130

I have often introduced an egg into the ovens for twenty days running, on whose hatching the time of its introduction; but the manager of the ovens was not as yet sufficiently skilled, or when he had not been sufficiently unwary, he has happened to let the heat rise to 36 or 40 degrees, on the day before that on which the chickens of the first eggs were to be hatched, the consequences of this accident have always been so fatal as I had expected they would be: chilling two or three or four days, sometimes more; fourteen left, not one chicken has been hatched; I should think which ought to have been hatched eighteen days, dead in their shells: but while other days there succeeded others which I had reason to be pleased with; every thing has been going right again, and there have been several days on which as many chickens hatched every day, as there would have been if the heat of the ovens had been within the requisite bounds.

No. 43



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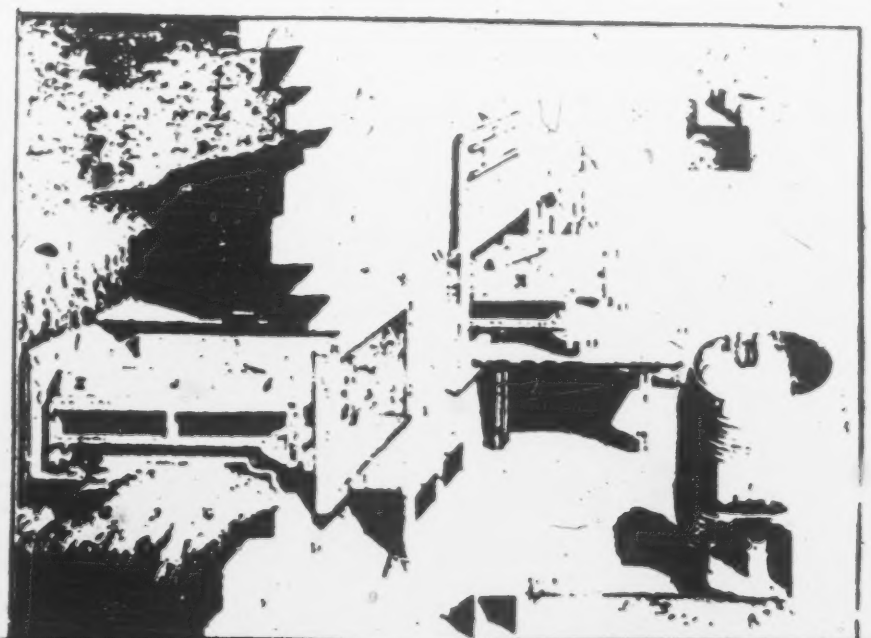


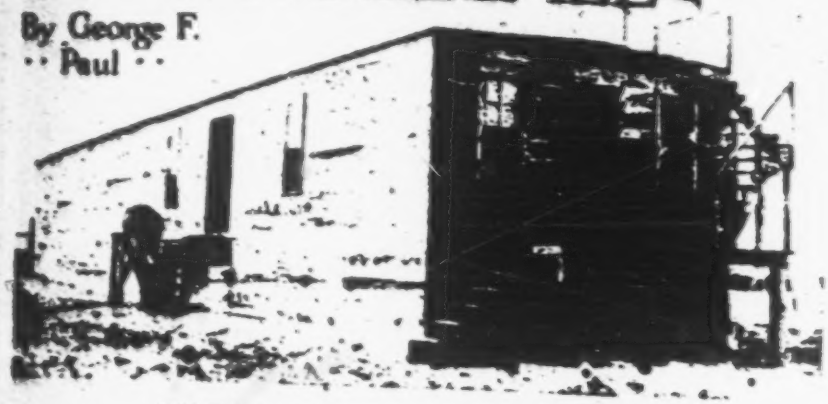
TECHNICAL WORLD MAGAZINE
APRIL 1913 PAGES 248, 249

1219

No. 45

HATCHING CHICKENS BY WHOLESALE

By George F. Paul



THE 150,000 EGG HATCHERY AT PORT CONNOR, TEXAS
The remarkable feature of this building is its smallness as contrasted with its capacity.

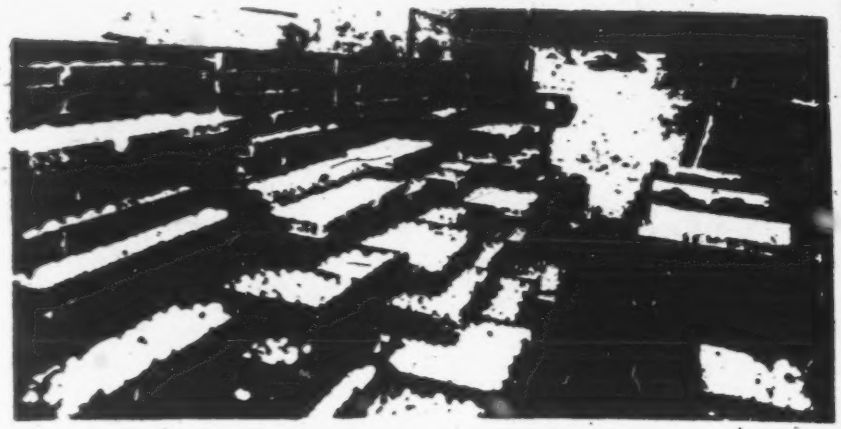
THERE is now in operation at Port O'Connor, Texas, a machine that is capable of turning out a chicken every twelve seconds for twenty-four hours a day, and for three hundred and sixty-five days in a year. This mammoth hatchery is the third of its type built by the inventor, who was formerly a poultry expert for the Government. It is the second largest hatching establishment in the world, being slightly exceeded in capacity by a hatchery at Petaluma, California, which holds 165,000 eggs as against 150,000 in the Texas machine.

The most remarkable feature of the plant is the fact that all the eggs [illegible] with room for candling, chick [illegible] and all engines, fans, and equipment, but a single floor sixteen [illegible] feet. Furnished with common [illegible], such a room would have just [illegible] same capacity in three weeks [illegible] hens in a single day.

[illegible] economy of space and [illegible] by placing the eggs in [illegible] boxes like the type cases in [illegible] case rack, or the trays in a [illegible]. This idea has been tried before but was not a success on account of the hot air rising. In the present instance, this difficulty is overcome by forcing a continual current of air from a centrifugal fan through the hatching chamber, which serves to keep it at an even temperature throughout. While this is quite an item of expense and would not pay with a small machine, yet in a big plant it is paid for several times over by the saving of the duplication of the small machines, as well as by the economy of the fuel and labor.

One of the unique improvements in the Texas plant is a turning system, by which compartments holding 10,000 eggs are swung on a pivot and the eggs turned by inverting the entire compartment. This enables one man to turn 100,000 eggs in less than two minutes. These eggs are ventilated and maintained at an equal temperature by an eight hundred pound centrifugal fan, requiring four horsepower to operate it, and the temperature is regulated to a tenth of one degree, while water sprays regulate the moisture to a similar nicety.

The eggs are not candled from the time they enter the hatchery until they leave.



SOME OF THE TRAYS OF EGGS

the inventor believing that cooling is injurious. The eggs need be handled but three times: first, when put into the machine; second, when tested; third, when the chicks are taken off and boxed for shipment. With such a plant one man can do the work of five men running small incubators, or of ten thousand setting hens.

The most obvious question asked by the visitors at the plant is, "Where will you get the eggs?" The reply is that they will be purchased from the larger poultry breeders throughout the Southern and Middle Western States. These breeders will ship in case lots at much lower rates for eggs and for transportation than is the case of the petty sales of one or two settings. Thus the hatchery becomes the quickest and cheapest way to stock up a new country with pure bred poultry. If pure bred eggs cannot be secured in sufficient quantities, huckster wagons will be sent through the heavy egg-producing districts in the counties to the north. Lavaca is the banner poultry county of Texas.

A 30,000-egg hatchery built last year in Oklahoma was filled by March first and thereafter turned eggs away. This plant shipped chicks through a radius of five hundred miles. Many of the Eastern poultry plants ship chickens to practically every State in the Union and the plants on the Pacific coast ship as far east as Colorado. The manager of the Port O'Connor plant expects to confine his business to Texas, which is today one of the best markets known for baby chicks and is so far removed from the other large hatcheries that the expense and losses in shipping prove a serious handicap.

Inexperienced people ordinarily expect better results from artificial incubation than are secured in actual practice. This is perhaps due to the advertisements of some incubator manufacturers. Farm eggs sent to the hatchery run from fifty to seventy-five per cent hatches of all eggs entered. City-bred stock varies greatly. Occasional lots of Leghorn eggs hatch upwards of eighty per cent. Eggs from heavy breeds are often at the opposite extreme and in some instances eggs are sent to the hatchery that fail to produce a chick.

Custom handling for poultry fanciers is likely to be unsatisfactory. The chief business of the hatchery will be that of producing baby chicks for outside sale and hatching eggs for local commercial poultry growers.

The local promoters hope by the help of this giant hatchery to build up a poultry community on the Texas coast very much like those hatcheries of California where, in some localities, notably Petaluma, poultry raising is the chief industry and has proved very profitable, incomes of as high as three thousand dollars a year being made off of ten acres.

INCUBATOR PATENT SUED ON IN JONES V CYPHERS, 126 F. 753 2ND C.C.A.

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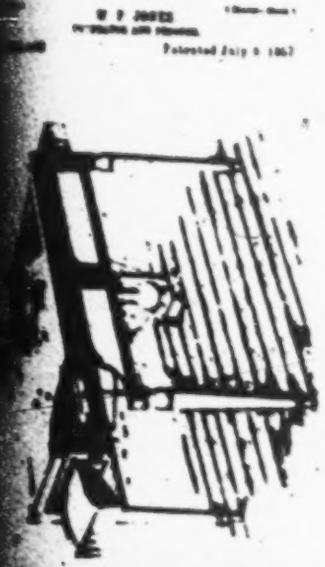
DEF. EX. 59
pg 4 10

No. 47



2ND C.C.A. HELD
TION IN JONES OVER

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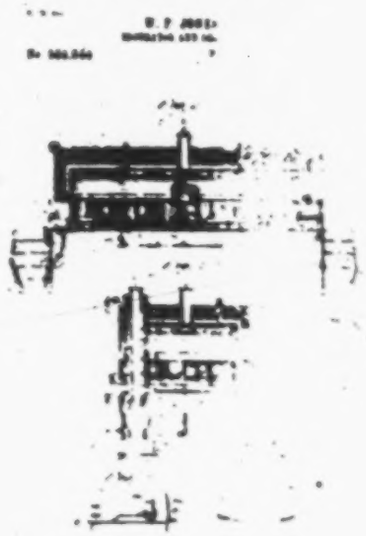

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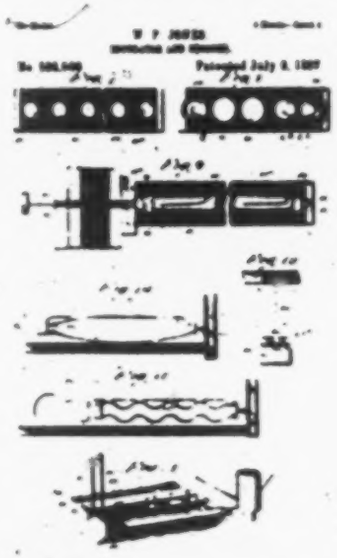

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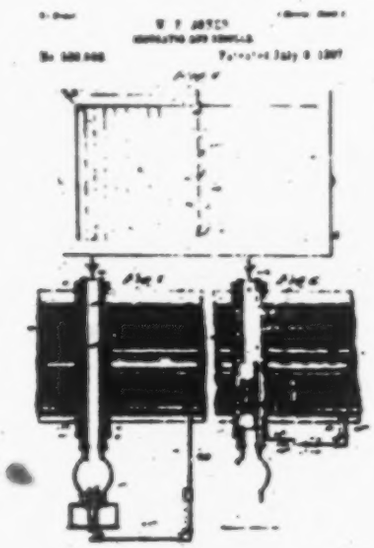
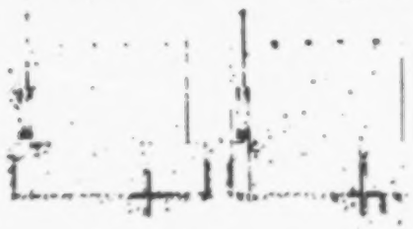


CLAIM 1 OF JONES PATENT 526,888

1. AN INCUBATOR OR BROODER COMPRISING A CLOSED CHAMBER HAVING A FRESH-AIR INLET, MEANS FOR HEATING THE CHAMBER, INCLUDING A HEATING DEVICE AND AN EXIT-PIPE CONNECTING SAID CHAMBER WITH THE HEATING DEVICE WHEREBY OWING TO THE DRAFT CAUSED BY SUCH HEATING DEVICE A POSITIVE CIRCULATION OF AIR WITHIN THE INCUBATOR OR BROODER IS PRODUCED SUBSTANTIALLY IN THE MANNER DESCRIBED.

No. 52
VAN DER HEYDEN
504,544 SEPT. 5, 1893



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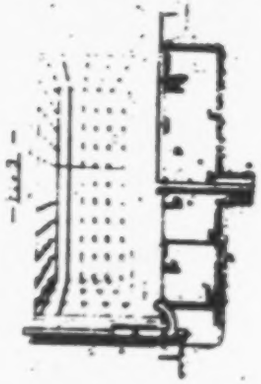

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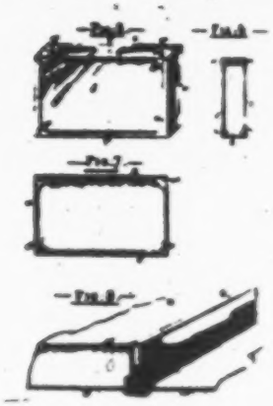
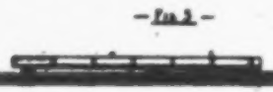


2ND C.C.A. HELD NO INVENTION IN JONES OVER VAN DER HEYDEN

No. 55

No. 56



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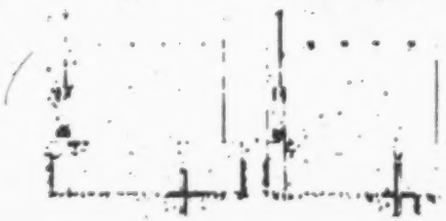
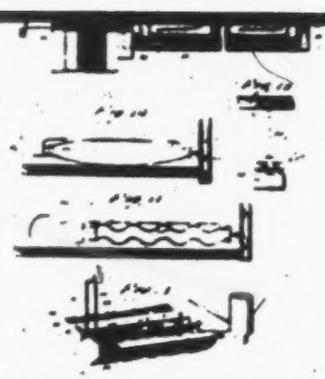
No. 58

...D. C.C.A. HELD
...ION IN JONES OVER

No.52
VAN DER HEYDEN
504,544 SEPT.5,1893





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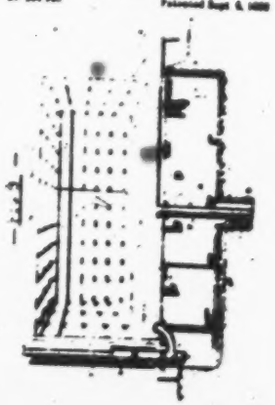

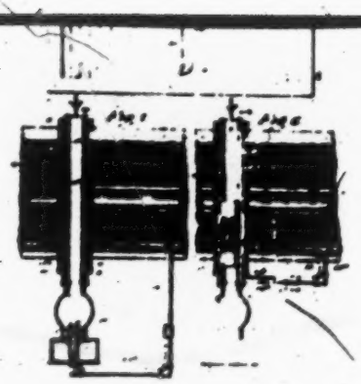

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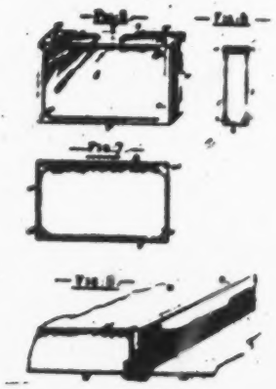
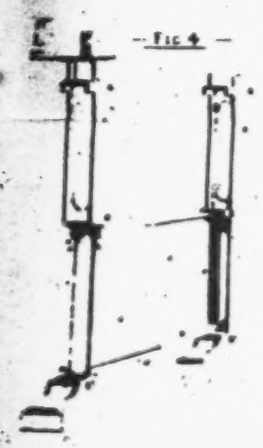


...SHIELD SWING TO THE DRAFT CAUSED BY SUCH HEATING DEVICE A POSITIVE CIRCULATION OF AIR WITHIN THE INCUBATOR OR BROODER IS PRODUCED SUBSTANTIALLY IN THE MANNER DESCRIBED.

2ND. C.C.A. HELD NO INVENTION IN JONES OVER VAN DER HEYDEN

No.55



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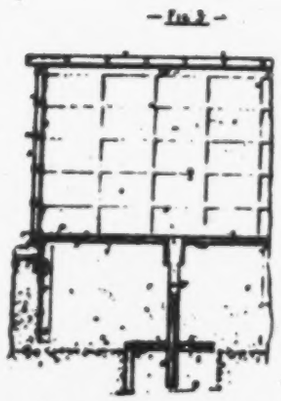

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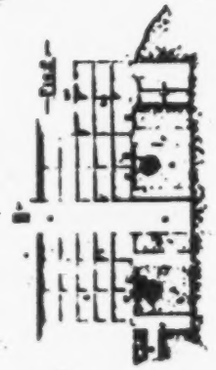

No.58

2ND. C.C.A. HELD JONES INCUBATOR PATENT AND VENTILATOR PATENTS OF SCHULZE AND VAN DER HEYDEN BELONG TO SAME ART.
ALSO HELD NO PATENTABLE INVENTION IN APPLYING SHULZE AND VAN DER HEYDEN VENTILATING DEVICES TO INCUBATOR.

DEFENDANT S' EXHIBIT No. 66

1222

STUDIES IN TRANSMISSION OF BACILLARY WHITE DIARRHEA IN INCUBATORS

By W. R. Hinshaw, C. W. Upp and J. M. Moore

Departments of Bacteriology and Poultry Husbandry, Kansas Agricultural Experiment Station, cooperating, Manhattan, Kansas

Introduction

A large number of inquiries concerning incubators, as a possible means of disseminating bacillary white diarrhea infection of chicks, led us to study this problem. A thorough search of the literature on the subject revealed no articles dealing with experiments on transmissibility in the incubator. Jones[3] was successful in isolating *S. pullora* from the inner shell membrane of eggs containing dead embryos and suggested incubator infection of chicks by their picking at egg-shells, infected droppings, etc. Rettger, Kirkpatrick and Stoneburn,[4] Durant,[2] Steiner,[5] and many other investigators refer to the possibility of incubator infection. As preventives they advise darkened hatching-trays at the time of hatching and thorough cleaning and disinfection after each hatch.

The continual circulation of chick-down in the forced-air-draught type of machine, at the time of hatching, suggested a possible means of dissemination. If a tray of chicks from an infected flock were hatching in the same incubator as trays from non-infected flocks, would it not be possible for the down from these infected chicks to carry infection to non-infected chicks? This is the problem that we proposed to study.

There are many phases to this problem and before satisfactory conclusions can be made all of these phases must be worked out. In this paper, we wish to dwell upon our preliminary studies of a few of them. These are: (1) the bacteriology of incubators, (2) *S. pullora* infection of chicks through the nostrils, and (3) artificial dissemination of *S. pullora* infection in incubators.

Bacteriology of Incubators

We made a qualitative study of the bacteriology of three forced-air-draught type incubators and one sectional type. We then made quantitative studies, and the results of these studies

Contribution No. 70 from Department of Bacteriology and No. 21 from Department of Poultry Husbandry. Received for publication, November 25, 1922.

will be published in another paper. We found that after each hatch there was a direct relationship between the time of incubation and the number of organisms (in a machine of the forced-air-draught type). After thoroughly cleaning and disinfecting the incubator, we obtained very few organisms. However, as soon as the chicks began to hatch, the number of organisms greatly increased until the chicks were removed. This was not true of the sectional type of machine, where the number remained approximately the same throughout the period of incubation, although at the time of hatching the flora changed to the same as that observed in the forced-air-draught type of machines.

The organisms found to cause this increase at hatching time were of two fecal types. Therefore, if it is possible to get an increase in fecal types of bacteria, it would seem logical to assume that *S. pullora*, which causes bacillary white diarrhea, might also be spread by the chick-down. In our early experiments with a machine which was hatching infected chicks, we were unable to isolate *S. pullora*. Later, in an artificially infected machine, we isolated this organism on three occasions, by exposing agar plates for one minute in various parts of the incubator.

Infection of Chicks Through the Nostrils

Our next step was to determine if chicks might be infected through the nostrils. The following experiment was made to ascertain this. Twenty half-day-old chicks were obtained from a flock free from bacillary white diarrhea. These were divided into three lots. Two lots were treated with pooled, 24-hour, broth cultures of six strains of *S. pullora*, and the third left untreated for controls.

Table I.—*Summary of autopsy results on chicks dying from artificial infection through the nostril*

Lot	1		2		3	
History	Inforted by swabbing nostrils with 24-hr. cultures of *S. pullora*		Inferted by injecting one drop of culture into nostrils		Controls	
Total number	3		7		11	
	No.	%	No.	%	No.	%
Died—b. w. d.	2	66.6	7	100.0	1	9.1
Died—other causes	1	33.3	0	0.0	7	63.6

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Lots 1 and 2 received treatment on two successive days. All lots were placed in a brooder and kept separate by means of a board partition. The summary of the results of the experiment is given in table I.

An examination of the records leaves no doubt that the chicks were infected by injecting a pooled culture of *S. pullora* into their nostrils. Nine, or 90 per cent of the chicks which were infected, died from bacillary white diarrhea. One chick of the control lot died from bacillary white diarrhea. As the chicks were from tested stock, this was probably due to infection from the treated lot, which was kept very near the check lot and the same attendant cared for both lots. Overheating is probably the cause of the death of the seven other controls, since the temperature increased several degrees above normal one day during the time the chicks were observed.

Dissemination of Bacillary White Diarrhea in the Incubator

After killing chicks by infection through the nostrils, we decided to try infection in incubators, and the following results of experiments are self-explanatory. A forced-air-draught, 2000-egg-capacity type of machine was used for all phases of this preliminary work, and it was thoroughly cleaned and disinfected after each hatch. Eggs set were from a flock free from bacillary white diarrhea. Controls were not kept in all cases, since records of livability on the 2438 chicks hatched from this flock, over a period of six months, were better than 90 per cent. The average hatchability of the 3505 eggs set from this same flock, over the same period, was 68.4 per cent. Furthermore, they hatched from eggs laid by non-carriers.

Experiment I. Transmission by infected down: The object of this test was to ascertain if chicks hatching in a forced-air-draught incubator could contract bacillary white diarrhea if the organisms were artificially present in that part or another part of the machine. The idea was that the forced circulation of air might carry the organism from one part of the machine to another, on down or any other material that might be present.

Some chick-down was taken from an incubator, sterilized and treated with 24-hour, broth cultures of six strains of *S. pullora*. This down was air-dried and placed in the incubator on the lowest egg-tray (the one closest to the hatching-trays in left compartment of the incubator). There were about 100 chicks

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clients buy eggs from tested flocks only and (2) by carefully cleaning and disinfecting incubators after each hatch. Custom eggs should not be hatched with eggs intended for hatching commercial chicks, unless it is known that the eggs come from tested flocks.

Conclusion

In conclusion we wish to state:

1. That bacillary white diarrhea was disseminated by artificially infected chick-down, placed in a forced-air-draught-type incubator.

2. That chicks hatching in the compartment opposite to the one in which infected down was spread did not suffer as high a per cent mortality as chicks hatching in the infected compartment.

3. That similar results were obtained by infecting the down of hatching chicks and exposing healthy chicks to the down which might be carried from the infected chicks to the non-infected.

References

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(Durand, A. J.: Bacillary white diarrhea. Univ. Mo. Agr. Exp. Sta. Cir. 83.
(Jones, F. S.: Fatal septicemia or bacillary white diarrhea in young chickens. Ann. Rpt. N. Y. State Vet. Col., 1910, pp. 111-139.
(Rettger, L. F., Kirkpatrick, Wm. F., & Jones, R. E.: Bacillary white diarrhea of young chicks. Storrs Agr. Exp. Sta. Bul. 77 (1914).
(Stuart, A. J.: Bacillary white diarrhea. Ky. Agr. Exp. Sta. Cir. 33.

DR. MILLER TO BUREAU OF DAIRYING

Dr. F. W. Miller has been appointed as veterinarian and physiologist in connection with the breeding research at the five experiment farms in which the Bureau of Dairying is interested. These are at Beltsville, Md.; Ardmore, N. Dak.; Huntley, Mont.; Woodward, Okla.; and Jeanerette, La. He will have supervision of the health of the herds at these places, with special reference to treatment for sterility; and will make anatomical studies with reference to the relation for conformation to milk production, and the physiology of milk production and reproduction in dairy cattle.

Doctor Miller was graduated in 1916 from Ohio State University, where he studied under and was a student assistant of Doctor Sisson. After graduation he went to the Oregon Agricultural College, as instructor in veterinary science and did research work in connection with the control of abortion and sterility. He has had wide experience in veterinary practice among the high-producing herds in the Willamette Valley. During the war he was in the army as a member of the Medical Corps.

1520

DEFENDANT S' EXHIBIT No. 67

SUMMARY

The disease, bacillary white diarrhea, is very prevalent in all parts of the country where studies have been made for its detection. This does not mean that every flock is infected, but from a general survey it means that about 75 per cent are suffering from this trouble. The disease affects both adult fowl and chicks. While greater attention has been drawn to the disease because of losses to chicks, there are probably also heavy losses of adults and losses due to low productivity and low fertility and hatchability of infected eggs.

The organisms are carried from generation to generation largely in the bodies of birds which suffered from the disease as chicks, but which recovered and continued to harbor the organism after reaching the period of production. The organism is then passed off in the egg to infect the embryo or newly hatched chicks. This infection of the ovary of the producing hen reduces productivity, fertility, and hatchability. After hatching, the infected chicks spread the disease widely to noninfected chicks through the dust of the incubator, through droppings, and by contaminating the ground, litter, and feeding and water utensils by their infected excreta.

The amount of actual money loss due to these birds is difficult to determine because of the confusion which exists concerning the cause of death in fowl. An accurate diagnosis of chick diseases is impossible outside a research laboratory. Numerous other causes of death produce clinical symptoms and pathological changes almost identical with those caused by *S. pullorum* infection. Thus, it is necessary to develop a method for correct differential diagnosis of various diseases before adequate data can be collected to determine this point.

There has been devised no adequate method of treatment for this disease. The only method of control consists of three steps: (1) The testing of the serum of all birds in the flock by means of the agglutination test; (2) the elimination of all reactors from the flock immediately after they are discovered; and (3) the careful use of strict sanitary measures for the runs, houses, and drinking and feeding utensils.

The data collected in this investigation indicate that a large per cent of infection may take place after birds have matured. The infectious material may be transferred through feeding and drink-

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THE INCUBATOR AS A SOURCE OF INFECTION

A large number of inquiries concerning incubators as a possible means of spreading bacillary white diarrhea, led the writers to study this problem. The complete report of the experiments on such dissemination has been published (Hinshaw, Upp, and Moore, 1926). A few observations and the preliminary results of this study, however, are presented herewith.

In a study of the bacteriology of various types of incubators, it was found that the bacterial content of the air in the forced-air-draft type of incubator increased very markedly at hatching time. This increase is due to two fecal types of bacteria that disappear upon cleaning and disinfection of the incubator and reappear at hatching time. These facts pointed to a possibility of a similar spread of *S. pullorum*, if infected chicks were present.

To prove that infectious material can be spread throughout the incubator, sterile chick down was saturated with a 24-hour culture of *S. pullorum*, and then air dried. This dried infected down was placed in a compartment of a forced-air-draft incubator just as the chicks were starting to hatch. Seventy-five controls were removed before the down was placed in the incubator and the remainder of the chicks, which were just hatching, left in the incubator for 38 hours. A total of 117 chicks hatched and were placed on a cleaned and disinfected room which had never been used for the brooding of chicks. None of the controls died from bacillary white diarrhea while 33, or 28.2 per cent, of the exposed chicks died from this disease.

In three other experiments, chicks were infected by saturating their bodies with *S. pullorum* culture as soon as the eggs were pipped, or immediately after hatching. These infected chicks were used to supply a source of infected down and normal chicks exposed to these in each compartment of the incubator. The summary of the results of these experiments is given in Table XV.

In the three experiments 316 chicks were under observation; 151 of these were either artificially infected or exposed to chicks artificially infected in the same compartment of the incubator; 140 were exposed to the artificially infected chicks but in the opposite end of the incubator. The 25 controls were not exposed, and were hatched in a cleaned and disinfected machine. Higher per cent mortality was observed in chicks exposed in the infected compartment of the machine than in the chicks exposed in the noninfected compartment. This was also true in the experiment where

1522

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chicks were exposed to infected down. Therefore, it seems that there is greater chance of incubator dissemination where normal chicks are in close quarters with the infected ones.

TABLE XV.—Summary of results obtained in transmission of bacillary white diarrhœa in incubators.

TREATMENT	Total number of chicks.	Total dying.		Total dying from bacillary white diarrhœa.		Total dying from other causes.	
		Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Chicks hatching in infected compartment of incubator	151	102	67.55	90	59.6	12	7.9
Chicks hatching in noninfected compartment but exposed to infected compartment	140	43	30.71	38	27.14	5	3.6
Controls	25	7	28.0	(a)	00	7	28.0

The results given in this article suggests a source of bacillary white diarrhœa dissemination not reported previously. However, since small numbers are involved, the experiments should be repeated, using larger numbers of chicks and better controls. Chicks from naturally infected eggs should also be used.

In these preliminary experiments it was impossible to get more than one incubator with which to work, and the only eggs which were available were some which were being hatched for determination of hatchability. All of these were from birds which were negative to the agglutination test for bacillary white diarrhœa, and records of hatchability and livability were available on 3,505 eggs incubated from this flock during a period of six months previous to the time these studies were started. The livability of the 2,438 chicks hatched was over 90 per cent. No outbreaks of bacillary white diarrhœa had occurred in this flock.

In all the experiments reported above, 529 chicks were used and 111 720.98 per cent) of these were controls. Only one control chick died with bacillary white diarrhœa, and this occurred in the first experiment to determine if chicks could be infected through the nostrils. In this case, the infected chicks were separated only by a loose board partition, and infection could easily be carried by the attendant, by mice, or by infected down carried by the air. In contrast to this one (0.9 of 1 per cent) which died of bacillary white diarrhœa in the controls, 170 or 40.68 per cent, of the exposed chicks

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died with the disease. In all of these cases the diagnosis was confirmed by bacteriological examination.

The period of incubation of the disease is from 48 to 72 hours. By a study of results summarized in the experiment where the infection depended entirely upon the chicks getting some of the down or other infective material, it was found that it was four days before the first death occurred in the infected compartment of the machine, and on the ninth day the maximum number of deaths was recorded. After 22 days no more deaths occurred and the chicks appeared normal. With the exception of one instance, no losses from bacillary white diarrhea were experienced in any experiment after the fourteenth day from the date of exposure. In this case the chick died on the twenty-second day.

In a study of the autopsy records, it was found that it takes about 24 hours longer to produce infection in chicks exposed to infective material which is in circulation in the incubator, than in chicks contaminated by saturation of their bodies with *S. pullorum*. Also, chicks infected by saturating their bodies before they break from the shells, die sooner than those treated from 12 to 24 hours after they are out of the shell. The question of how the disease is produced after such infection is a problem which still remains to be solved. Probably, when the culture is injected around the chick in the shell, some of it reaches the digestive tract through the mouth or the allantoic circulation. This may account for the earlier apex of mortality in these chicks than in those infected in the same manner after they are hatched. The infected down may reach either the digestive tract or the respiratory tract through the mouth or nostrils.

The question of whether the chick down, pieces of shell, and droppings from naturally infected chicks are a similar source of dissemination yet remains to be settled. There is no doubt but that fecal organisms spread throughout the incubators of the forced-air-draft type; and since it has been proved that the infected droppings are one of the chief sources of infection, it is logical to assume that *S. pullorum* can be transmitted throughout the machine by the air current. This may also be true with other types of machines. It is planned to report on this phase of the problem later.

One hatcheryman, cooperating with the writers, says that he has seen typical examples of just such infection, but no definite data are available to prove it. One field example has been reported

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DEFENDANT S' EXHIBIT No. 70

Hatching (*after von Baer*). About the fourteenth day the growing embryo accommodates itself to the form of the egg so as to lie parallel to the long axis with its head usually towards the broad end near to the air-chamber. Sometimes, however, the embryo is turned in the reverse position (von Baer). The head is bent towards the breast, and is usually tucked under the right wing. Important changes preparatory to hatching take place on the seventeenth to the nineteenth days. The fluid decreases in the amnion. The neck acquires a double bend so that the head is turned forward, and, in consequence, the beak is towards that part of the membranes next to the air-chamber. The intestine is retracted completely into the body-cavity, and on the nineteenth day the yolk-sac begins to enter the body-cavity. On the twentieth day the yolk-sac is completely included, and practically all the amniotic fluid has disappeared. The chick now occupies practically all the space within the egg, outside of the air-chamber. The umbilicus is closing over. The ductus arteriosi begin to contract, so that more blood flows through the lungs. The external wall of the allantois fused with the chorion still remains very vascular.

Now, if the chick raises its head, the beak readily pierces the membranes and enters the air-chamber. It then begins to breath slowly the contained air; the chick may be heard, in some cases, to peep within the shell two days before hatching, a sure sign that breathing has begun. But the circulation in the allantois is still maintained and it still preserves its respiratory function. When the chick makes the first small opening in the shell, which usually takes place on the twentieth day, it begins to breathe normally, and then the allantois begins to dry up and the circulation in it rapidly ceases. It then becomes separated from the umbilicus, and the remainder of the act of hatching is completed, usually on the twenty-first day.

DEFENDANT'S EXHIBIT No. 73

REPORT OF HATCH OF SEPT. 16, 1930

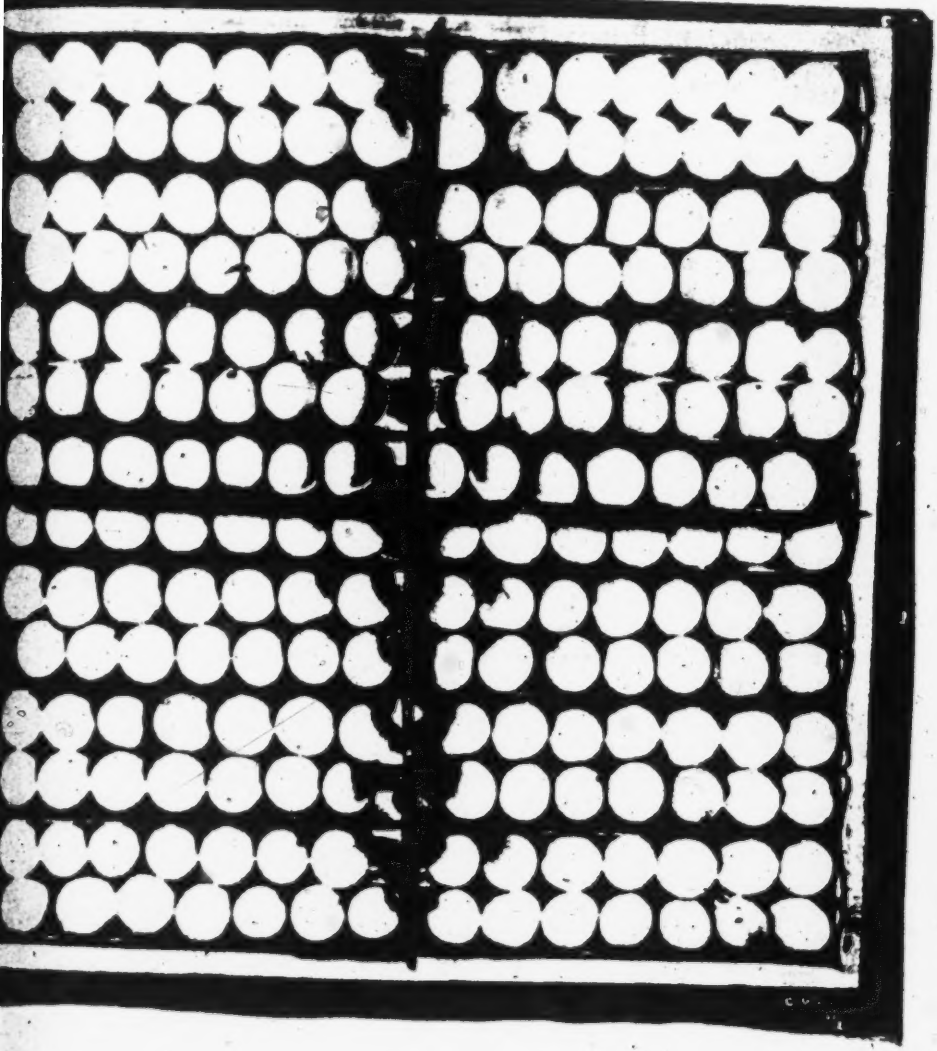
Tray No. C6C
(Identified by photos showing tray numbered C6C, C6C-2, C6C-3)

Set August 25 10:30 A.M.
Chicks taken off September 16. 10:40 A.M.
Position in cabinet: Fourth tray from top

Turbulator running

No. of eggs set	196	
" " infertile eggs	36	
" " dead germs and chicks that failed to get out	24	50
" " chicks hatched		146
	196	196

Percentage hatch of fertile eggs - - - - - - - - - - - - - - - - 85.88%



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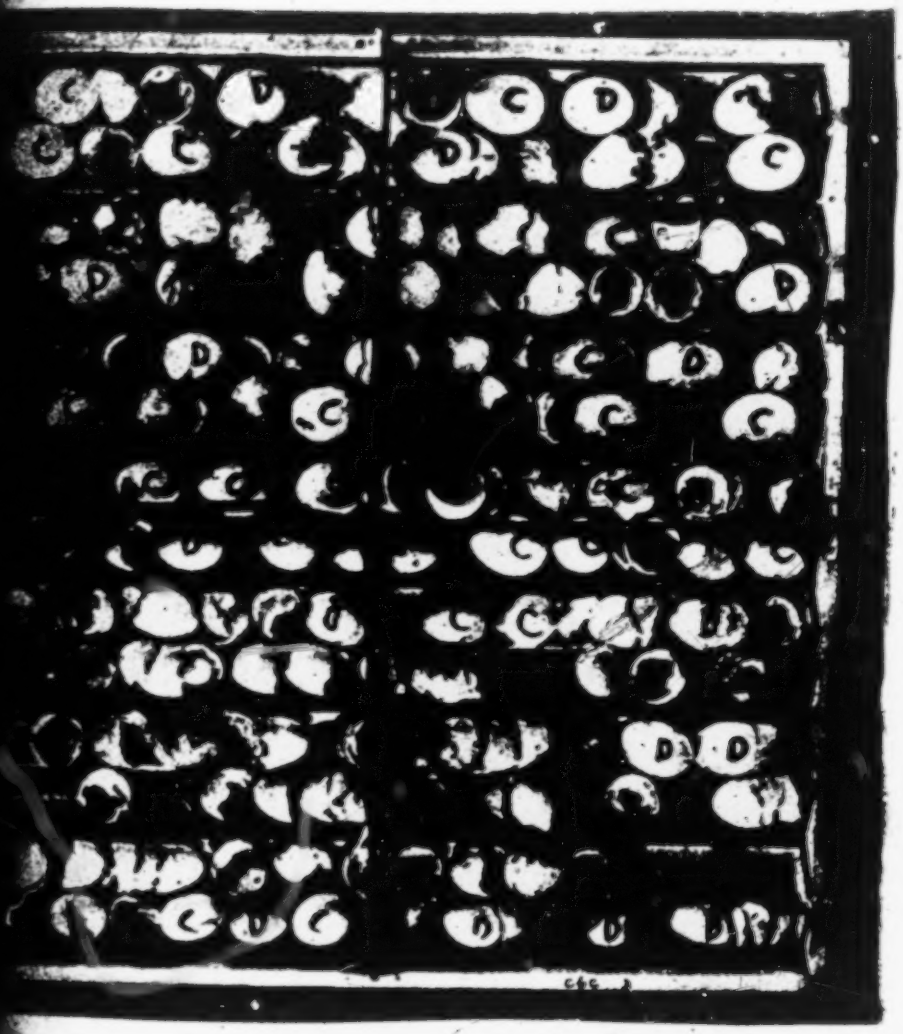

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1235

REPORT OF HATCH OF SEPT. 16, 1930

Tray No. B6
(Identified by photos showing tray numbered B6, B6-2, B6-3)

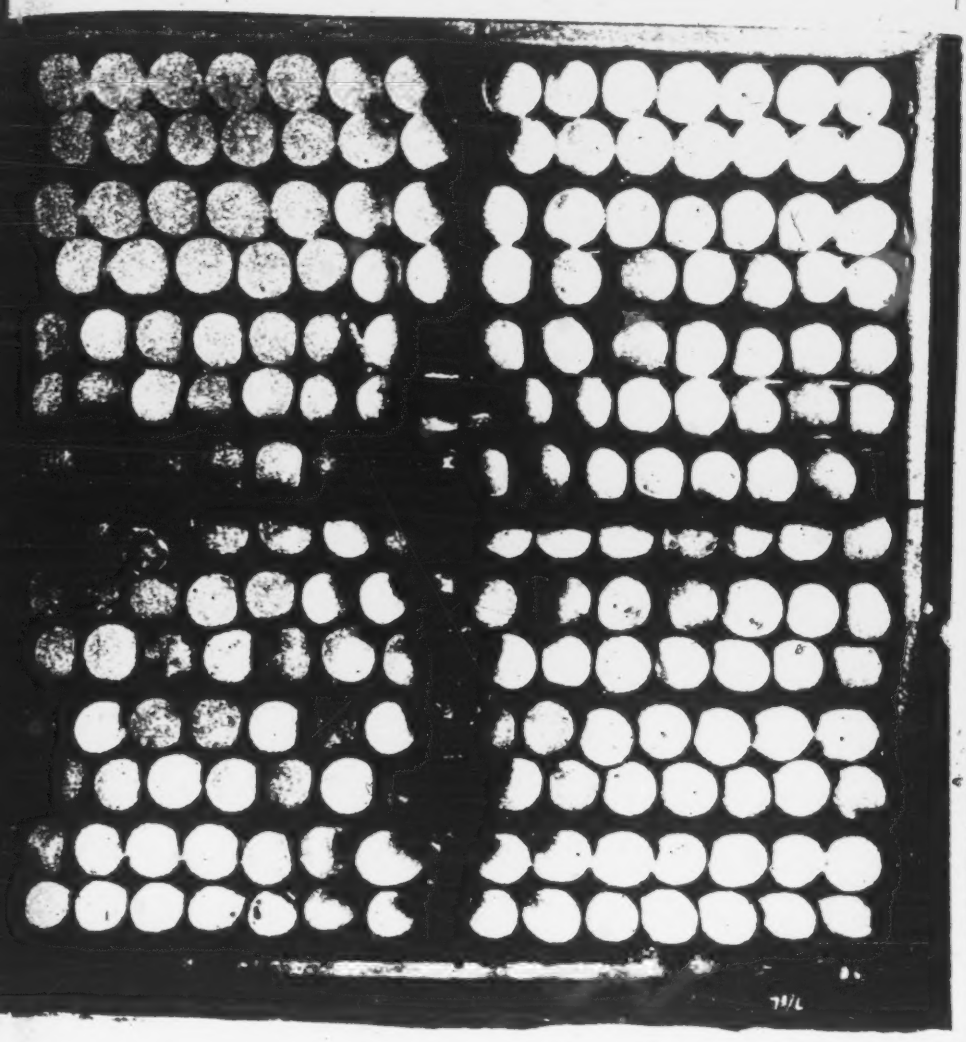
Set August 25 10:30 A.M.
Chicks taken off September 16 10:00 A.M.
Position in cabinet: Fourth tray from top

Turbulator out

No. of eggs in tray	196	
" " infertile eggs	33	
" " dead germs and chicks that failed to get out	28	
" " chicks hatched	135	
	196	196

Percentage hatch of fertile eggs - 82.82%

1530



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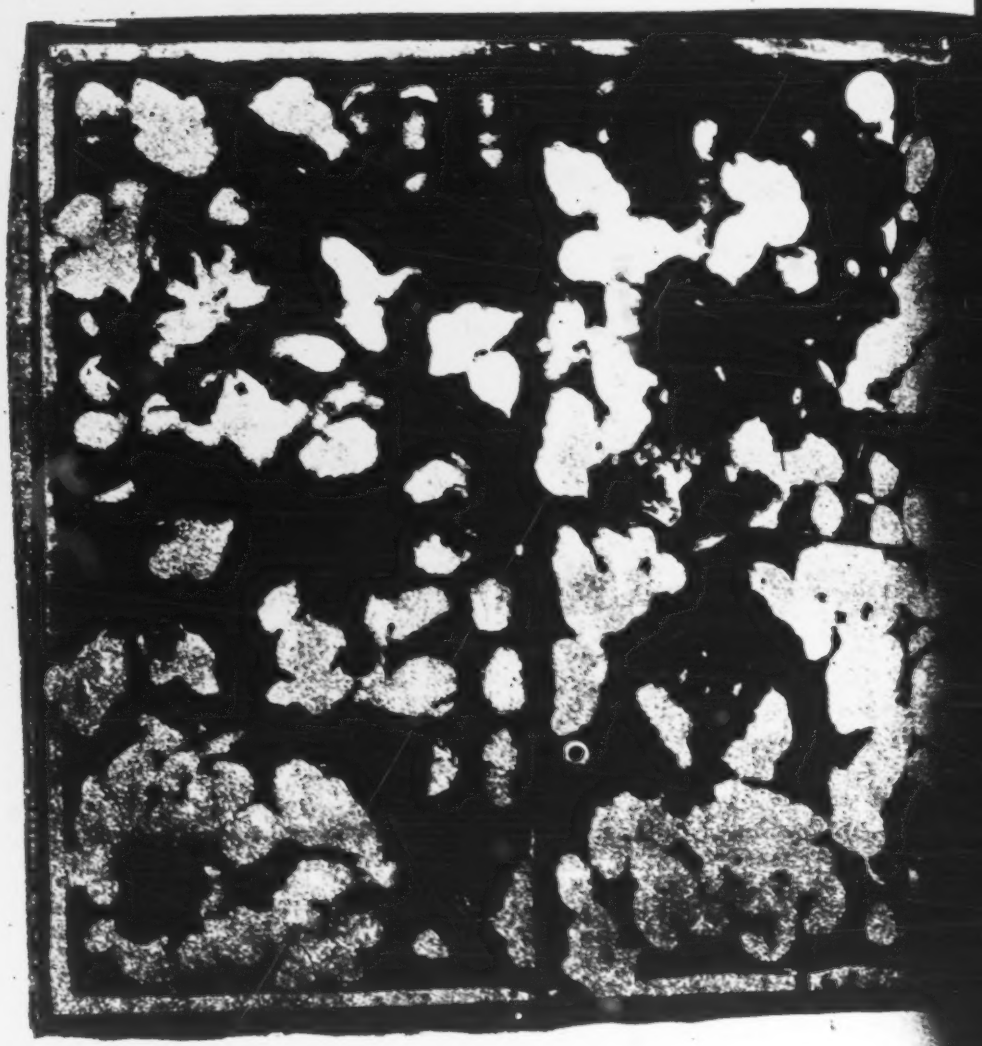

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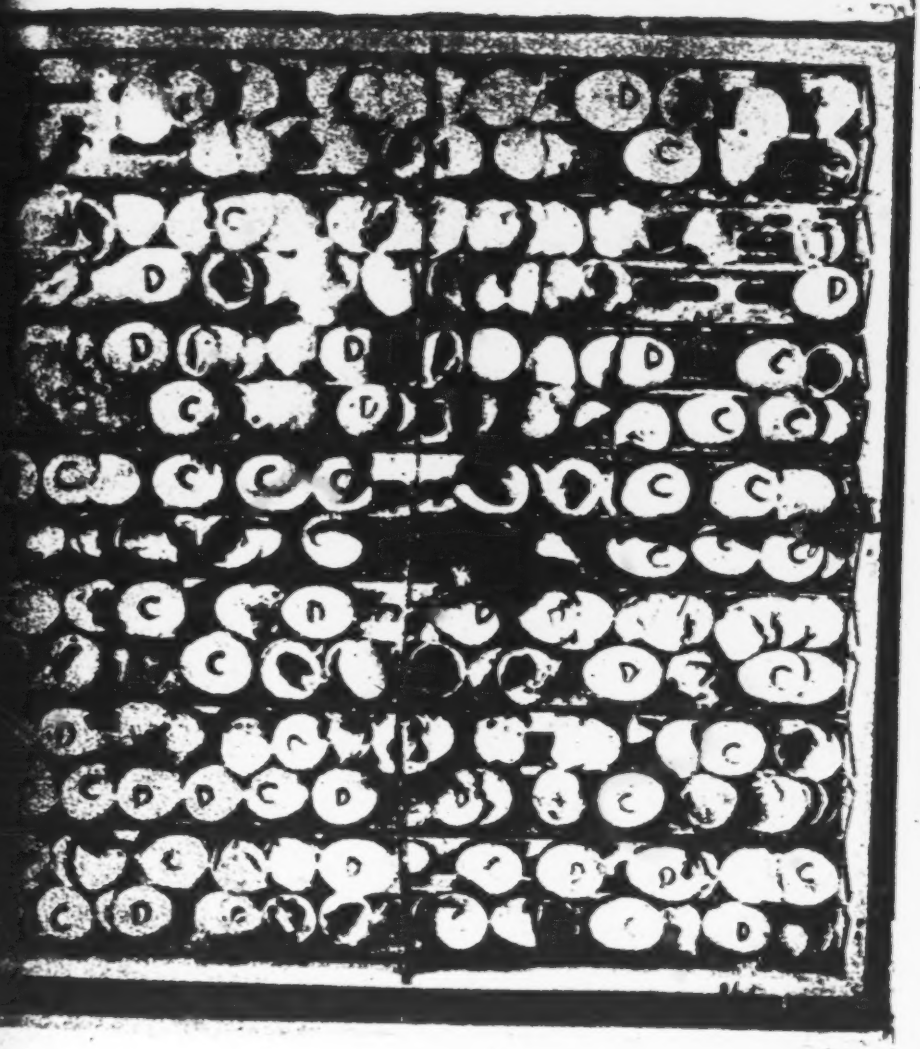


1239

REPORT OF HATCH OF SEPT. 16, 1930

Tray No. E2
(Identified by photos showing tray numbered E2, E2-2, E2-[illegible]

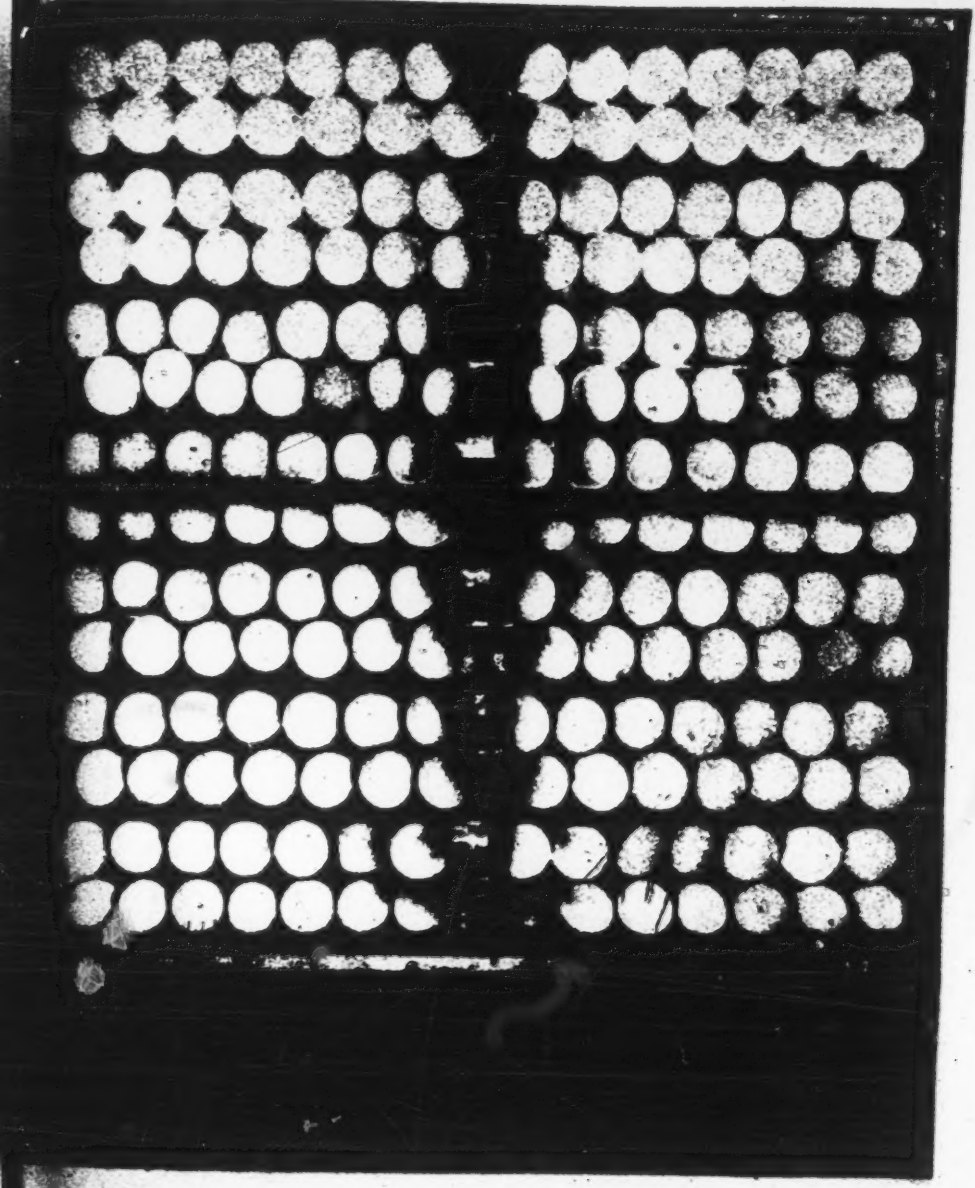
Set August 25 10:30 A.M.
Chicks taken off September 16 11:00 A.M.
Position in cabinet: Eighth tray from top

Turbulator running

No. of eggs in tray	196	
" " infertile eggs		44
" " dead germs and chicks that failed to get out		18
" " chicks hatched		[illegible]
	196	[illegible]

Percentage hatch of fertile eggs [illegible]

1534



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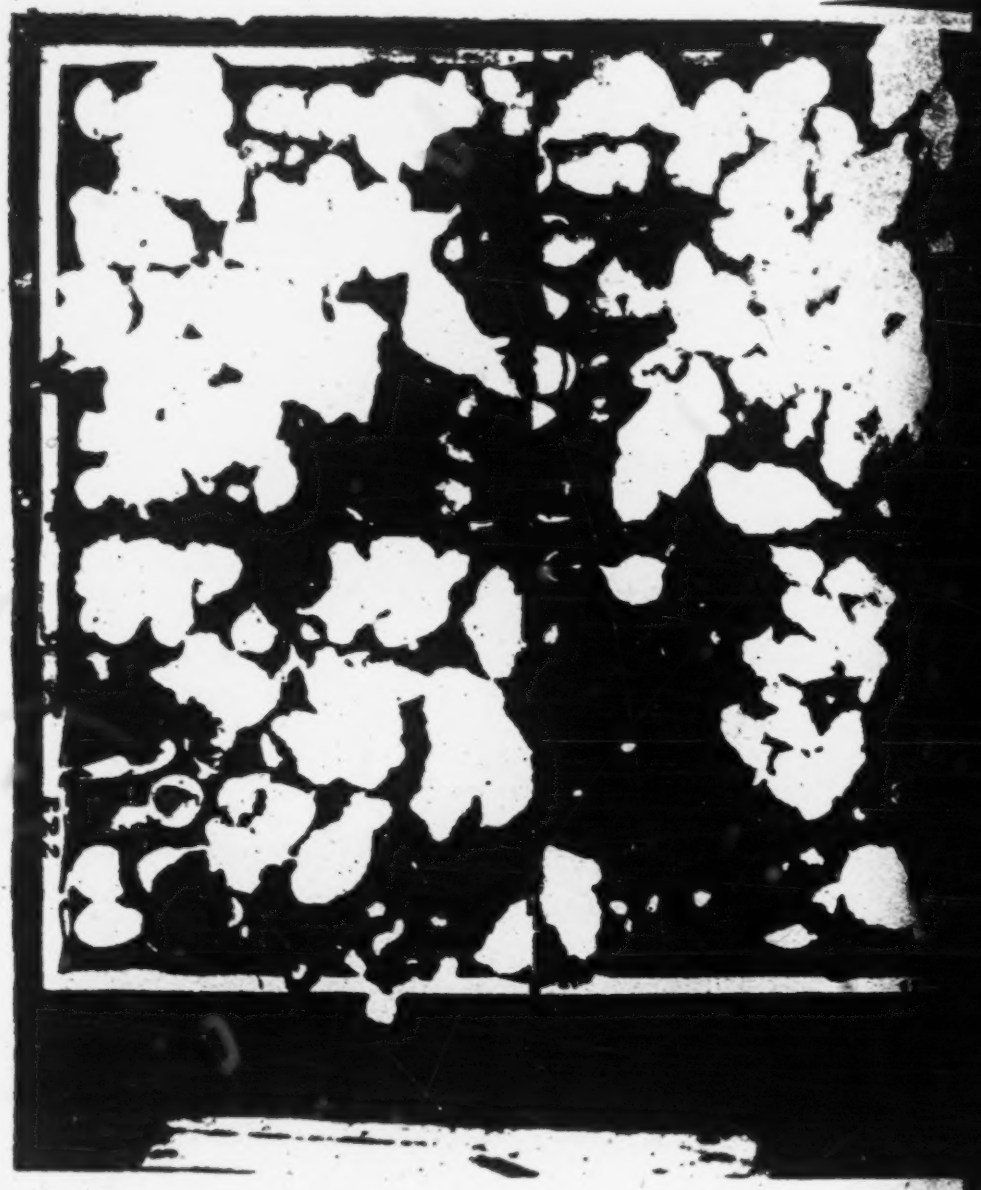

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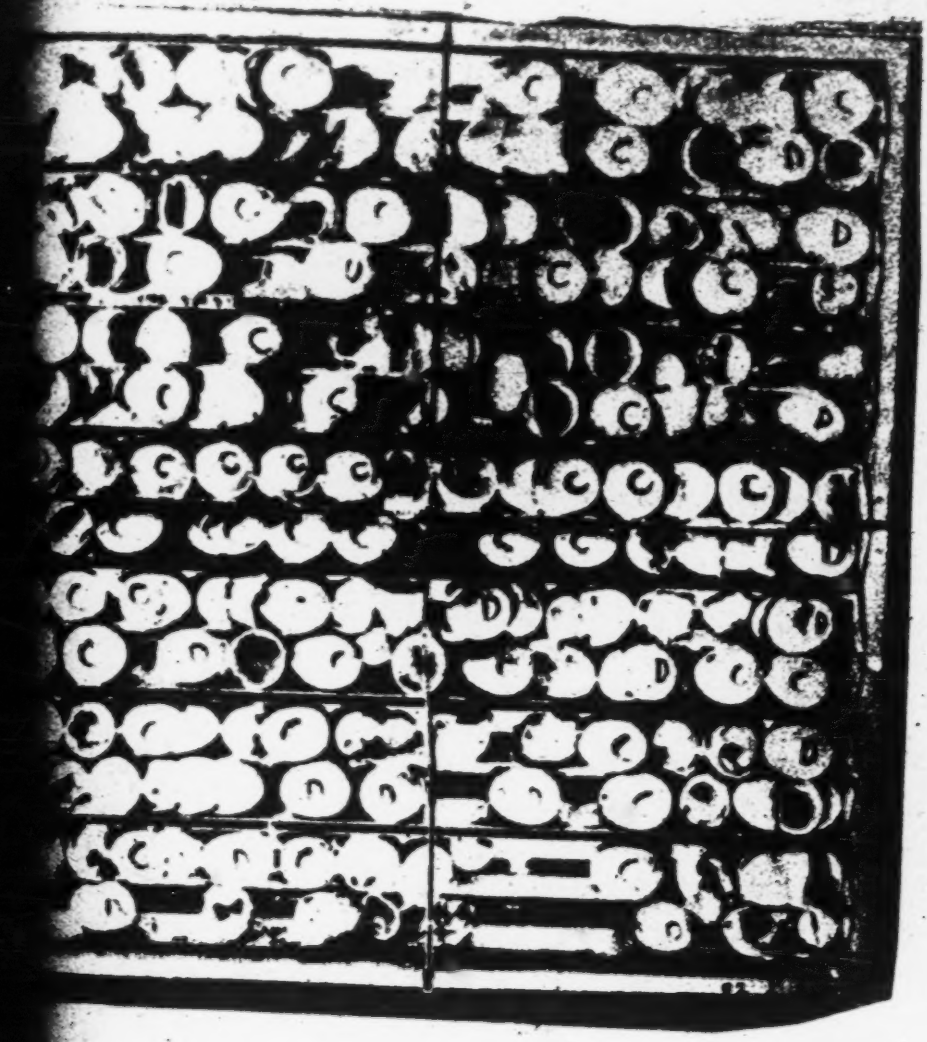


1537

REPORT OF HATCH OF SEPTEMBER 16, 1930

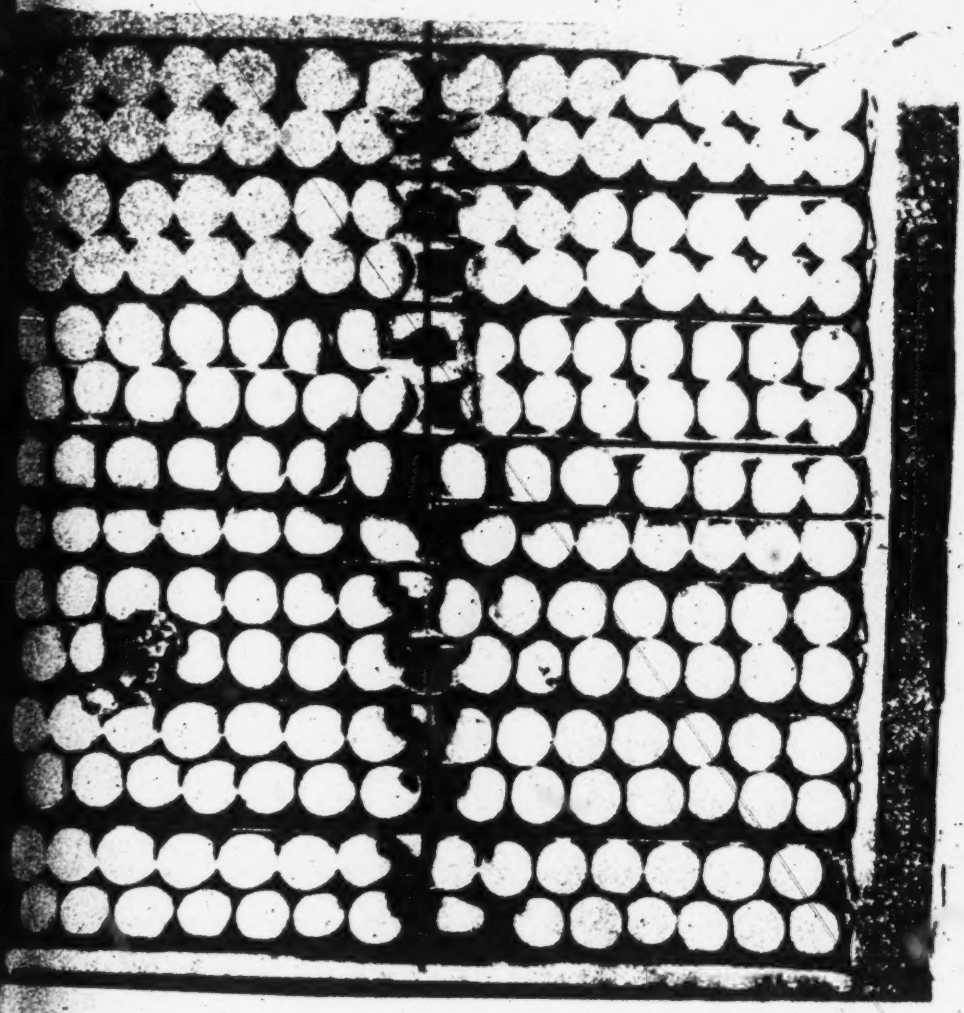
Tray No. D6 (Identified by photos showing tray numbered D6, D6-2, D6-3)

Set August 25 10:30 A.M.
Chicks taken off September 16 10:20 A.M.
Position in cabinet: Eighth tray from top

Turbulator out

No. of eggs in tray	196	
" " infertile eggs	27	
" " dead germs and chicks that failed to get out	29	56
" " chicks hatched		140
	196	196

Percentage hatch of fertile eggs - - - - - - - - - - - - - - - - - 82.84%



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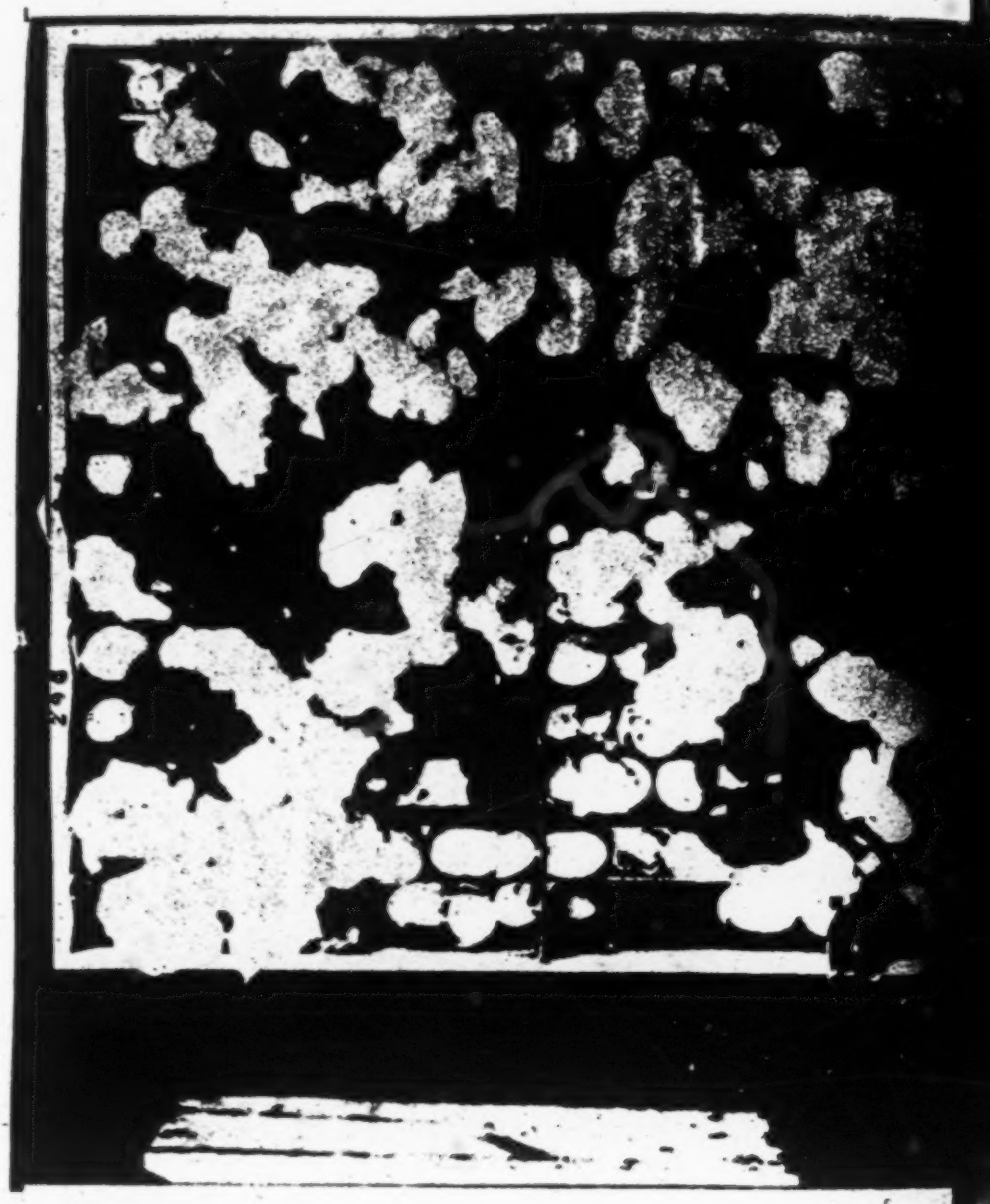

1540

DEFENDANT S' EXHIBIT No. 74 A

JAMESTOWN RESEARCH LABORATORY

AIR CAPACITY OF SMITH INCUBATOR FAN

OLD STYLE BLADE, 16" DIAM, 4-BLADES, 3½" PITCH

DATE 1-24-24

OBSERVERS J.A.S. ~ W.H.K.

REV. PER MIN.	BAR. PRESS. IN. Hg.	WATTS PER HOUR	FAN PRESS. IN. OIL	t.d. DEG. FAHR.	t_w DEG. FAHR.	REL. HUM. %	GR. PT. PER LB.	Dt. AL. PER LB. DR. AIR	VELOCITY (ft/min)	DELIVERY CFM	REMARKS
1630	28.80	500	0.008	75.9	57.2	28.5	43.538	241.285	2000	1045	
1630	"	"	0.05	76.6	57.2	28.6	43.814	241.300	2067	908	
1630	"	"	0.114	76.7	57.0	28.0	43.573	241.300	2150	645	
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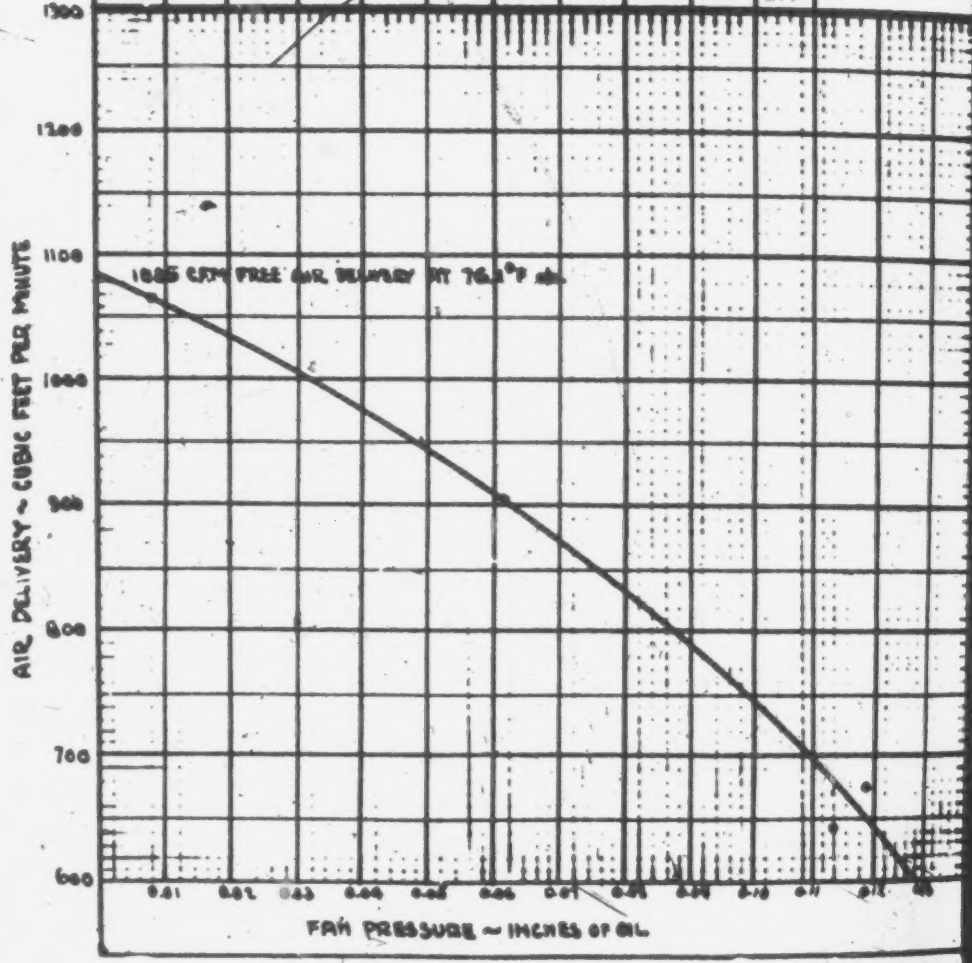
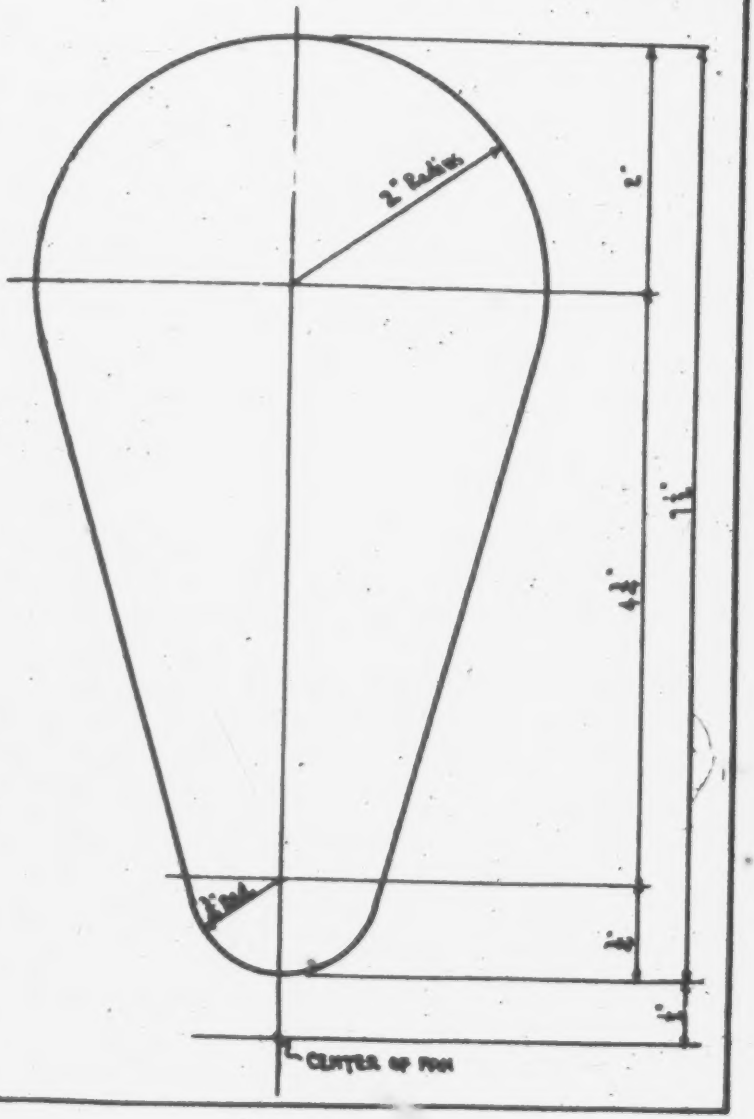


DEFENDANT 8' EXHIBIT No. 74 .B

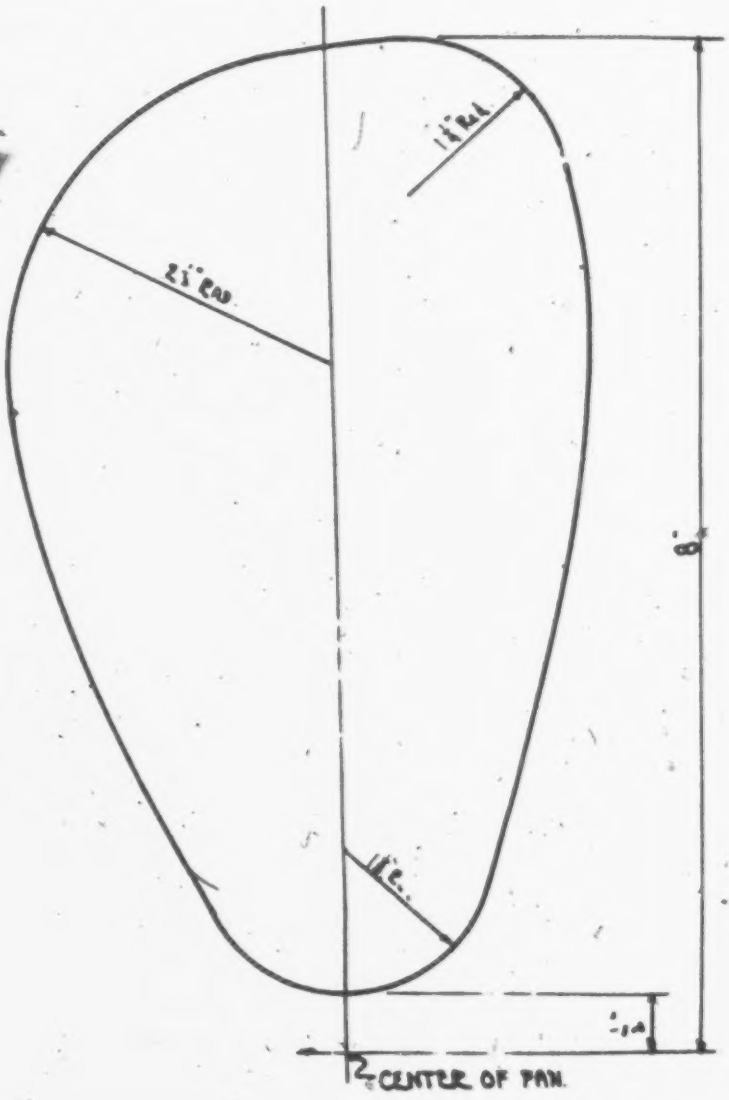
[illegible] Research Laboratory	OLD STYLE BLADE-SMITH INCUBATOR FAN	Date 1-25-26 [illegible]



DEFENDANT S' EXHIBIT No. 74 C

1249

JOHNSON RESEARCH LABORATORY	NEW STYLE BLADE, SMITH INCUBATOR FAN	DATE 1-28-24



1544

DEFENDANT S' EXHIBIT No. 74 D

JAMESWAY RESEARCH LABORATORY

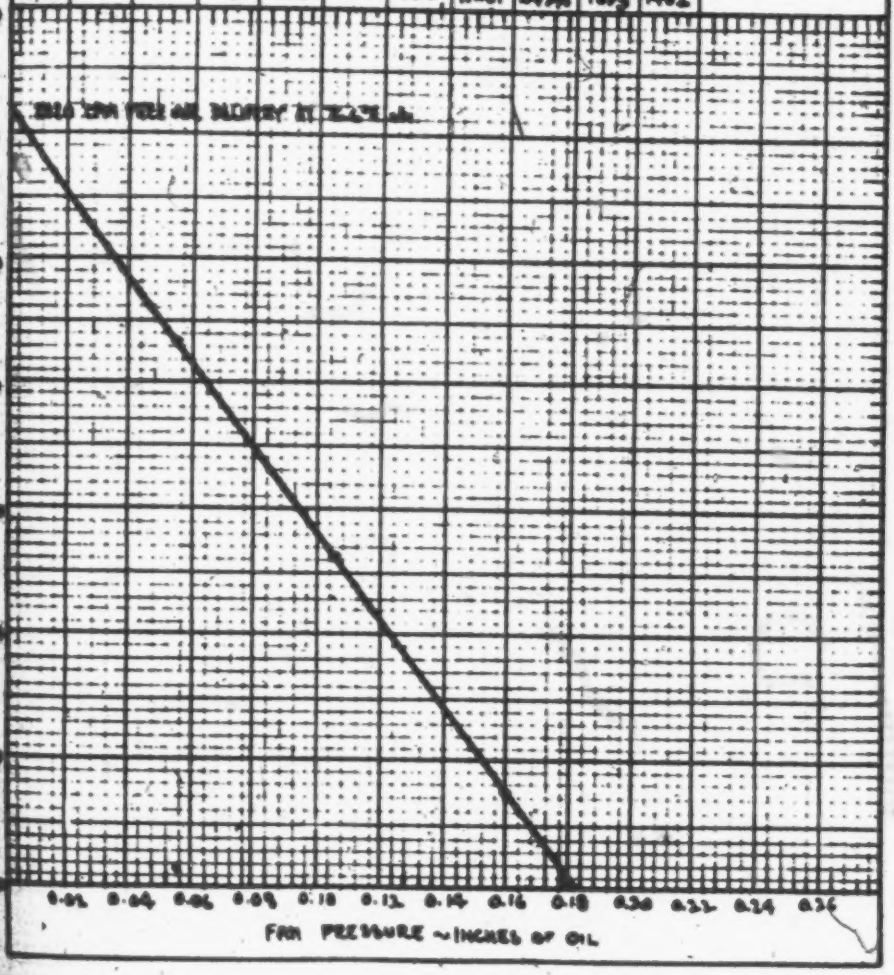
AIR CAPACITY OF SMITH INCUBATOR FAN

NEW STYLE BLADE. 16" DIAM., 4 BLADES, 1⅝" PITCH

DATE 1-23-34

OBSERVERS [illegible]

REV. PER MIN.	BAR. PRESS. IN. HG.	WATTS METER INPUT	FAN PRESS. IN. OIL	°F. DRY BULB	°F. WET BULB	REL. HUM. %	CU. FT. PER LB.	B.T.U. PER LB. PRESS.	MILLI-VOLTS (C-C)	DELIV-ERY CFM.	REMARKS
1630	28.80	300	0.085	76.7	56.8	27.7	[illegible]	[illegible]	1162	1834	
1630	"	"	0.105	76.8	57.6	27.8	[illegible]	[illegible]	1382	1665	
1630	"	"	0.160	76.8	57.9	27.5	[illegible]	[illegible]	1948	1475	
1630	"	"	0.188	76.5	57.8	27.5	[illegible]	[illegible]	1523	1402	



Offered Vol 12, p 1272.

PLAINTIFF TAGGART'S EXHIBIT 11 A, B, C BASED ON EX-PARTY TESTS WITHOUT DEFENDANT PRESENT	TESTS ON SMITH MACHINE - EXHIBIT BY JAMES AT BUFFALO DURING TRIAL IN INTER-PARTY'S TESTS	SMITH MACHINE PRODUCED BY JAMES AT BUFFALO DURING TRIAL CORRECTED TO MAKE AIR SPEED DELIVERED BY FANS SAME AS THAT REPORTED BY TAGGART ON SMITH MACHINE OF EXHIBIT 11 A, B, C OF 1200 FEET.
Taggart testified eggs in machine 47,000 to 52,000 eggs with 1,200 linear feet per minute air delivery by fans (Rec. 318), and Vol 12 p 1270 Greene)	Machine filled with 47,000 eggs and fans delivering 749 linear feet per minute.	Taggart reported Smith machine of Ex-Party test 11 A, B, C at 1,200 feet per minute linear speed of air leaving fans (Rec. 312). (Vol 12 p 1270 Greene)
Average velocity reported by Taggart in Exhibit 11 A, B, C, in egg column of Smith machine 73 feet per minute with eggs in the machine. (Vol 12 p 1270 Greene)	Air speed through column of eggs 142.8 feet per minute, or about twice that reported by Taggart in 11 A, B, C, but with lower linear speed of fan delivery of 749 feet as compared with 1,200 feet of the Taggart 11 A, B, C Smith machine test. (See vol 12 p. 1269, Greene) Insert 75 Insert - 75	Correct air speed through column of eggs in the Smith machine of the dimensions, capacity, and fan speed reported by Taggart in 11 A, B, C is 228 feet per minute. This is 3.11 times Taggart's report of air speed in egg column in 11 A, B, C, pursuant to Greene's testimony that air through egg column in Smith machine would be three to four times greater with eggs than without eggs. (Vol 12 p 1271 Greene) Insert 75 Greene - 2

C. W. ZIMMER.

SEMIFIBELESS INCUBATOR.

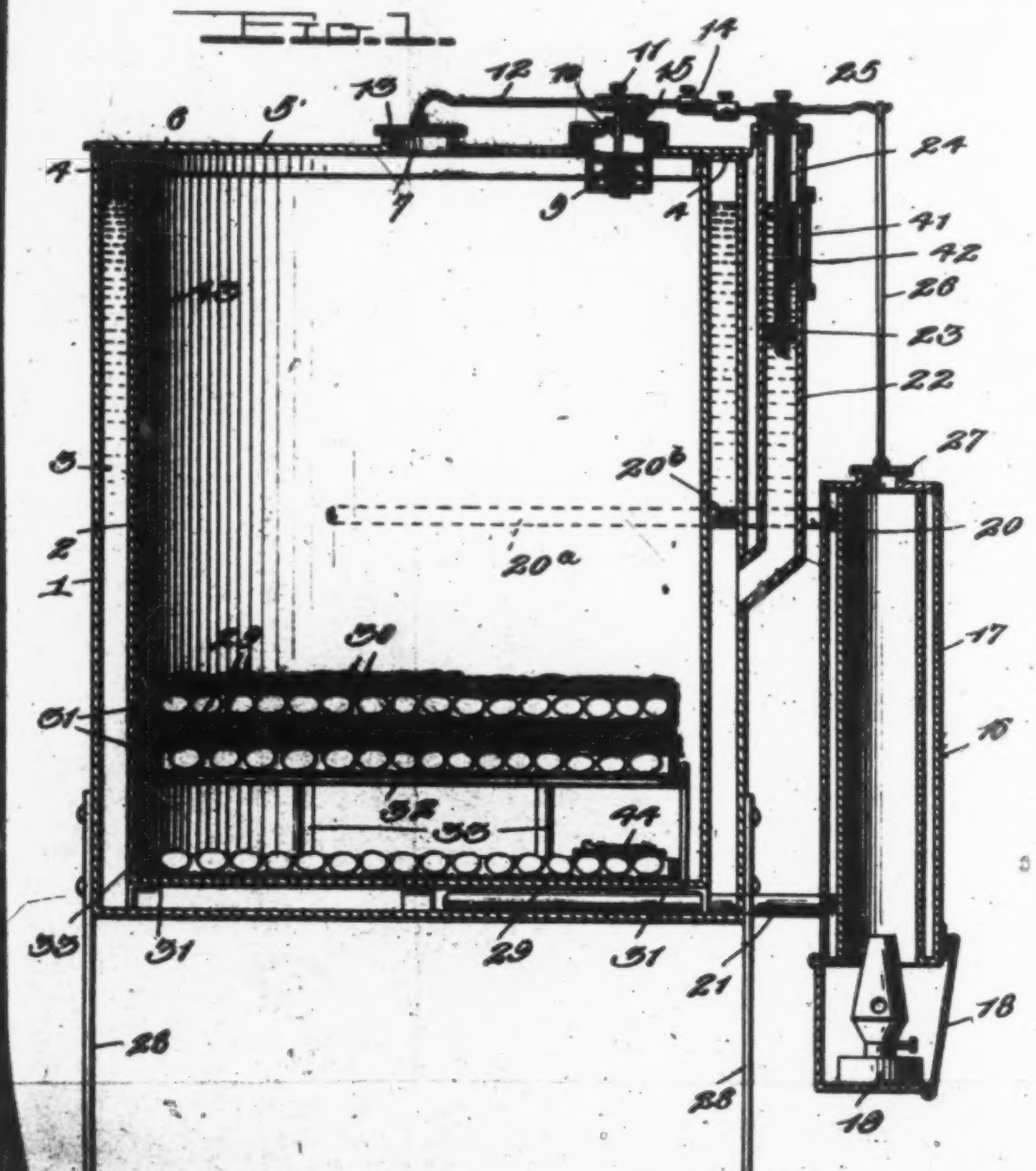
APPLICATION FILED DEC. 14, 1911.

1,075,747.

Patented Oct. 14, 1913.

3 SHEETS—SHEET 1.

Fig. 1.

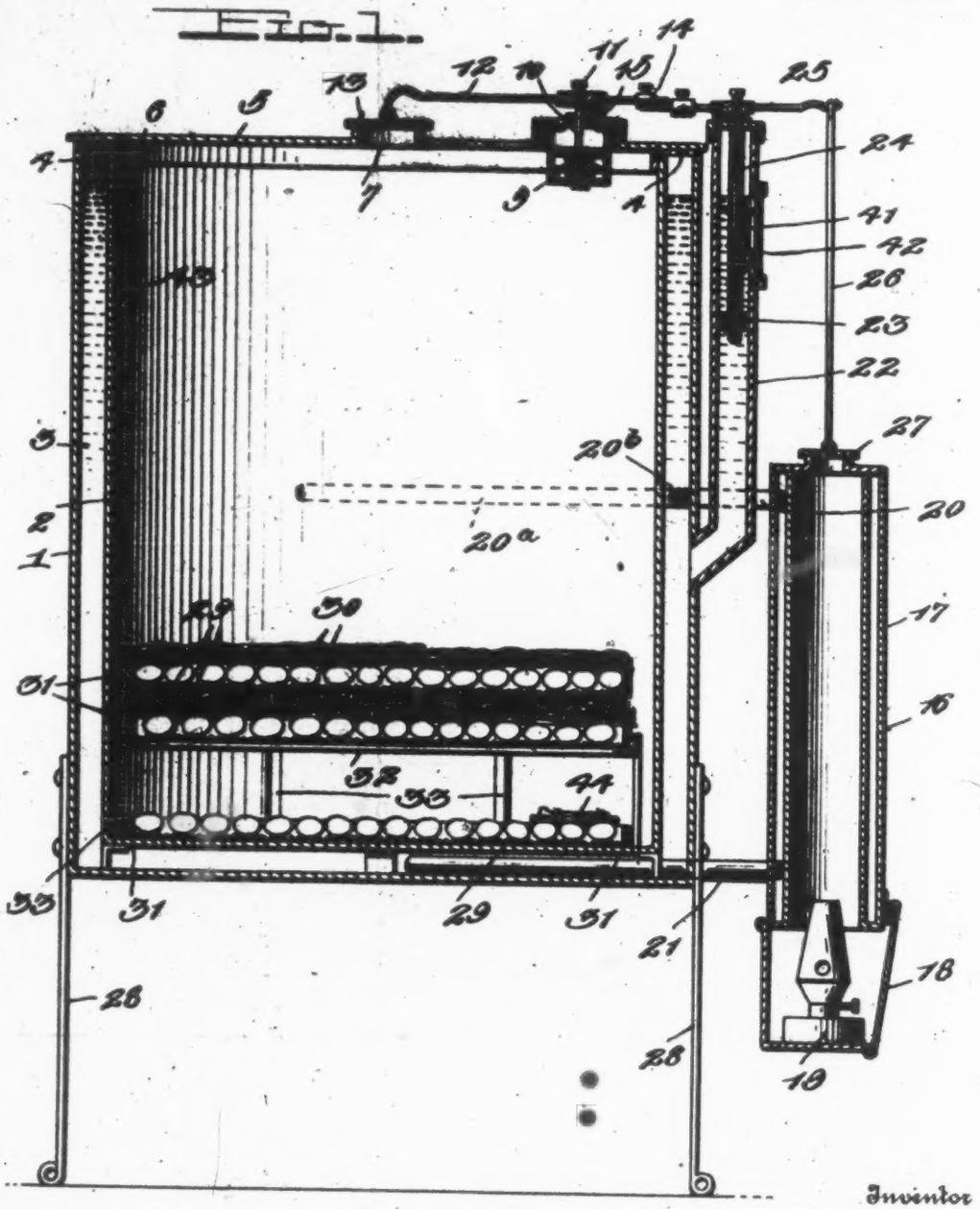


1,076,747.

Patented Oct. 14, 1913.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses
Chas. L. Griesbauer.
G. B. Norton.

Inventor
Cyrus W. Zimmer,
By Watson E. Coleman
Attorney

1253

C. W. ZIMMER.

SEMIFIRELESS INCUBATOR.

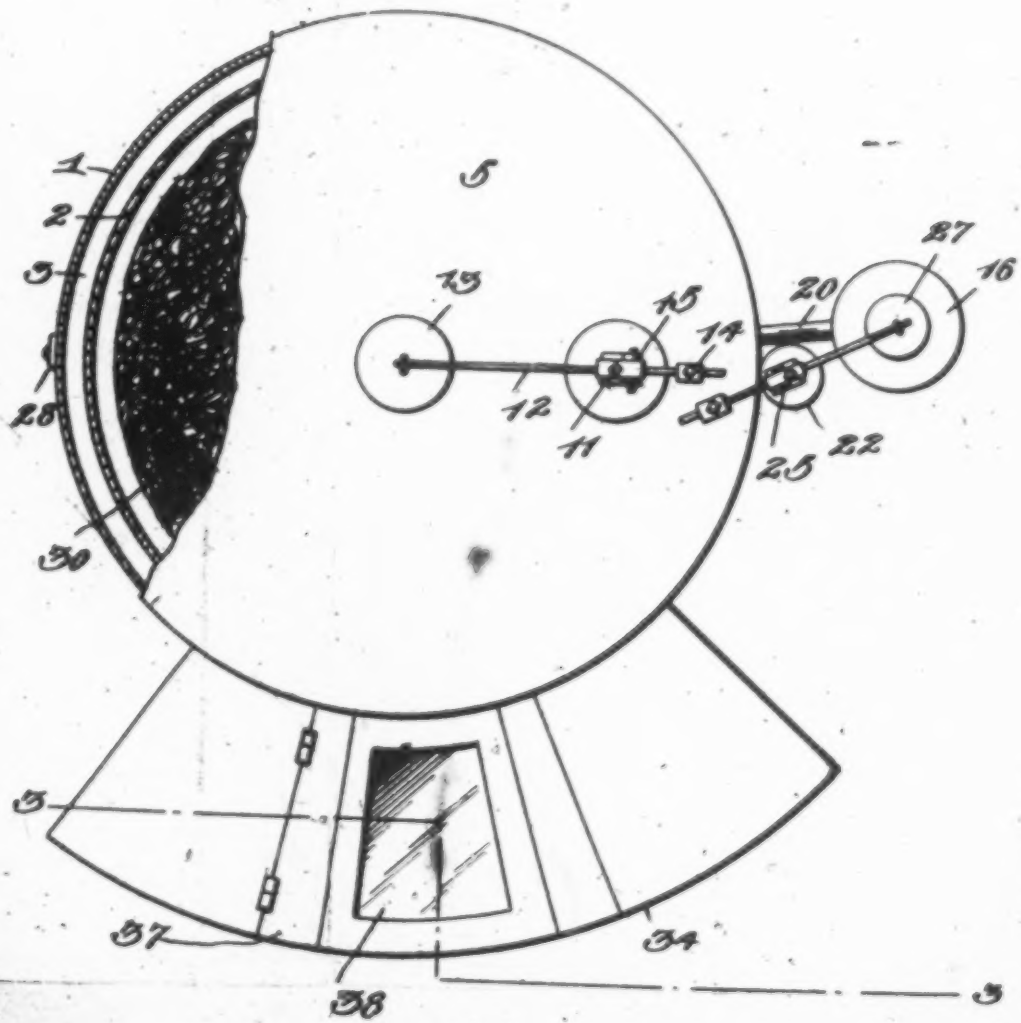
APPLICATION FILED DEC. 14, 1911.

1,075,747.

Patented Oct. 14, 1913.

3 SHEETS—SHEET 2.

Fig. 2.



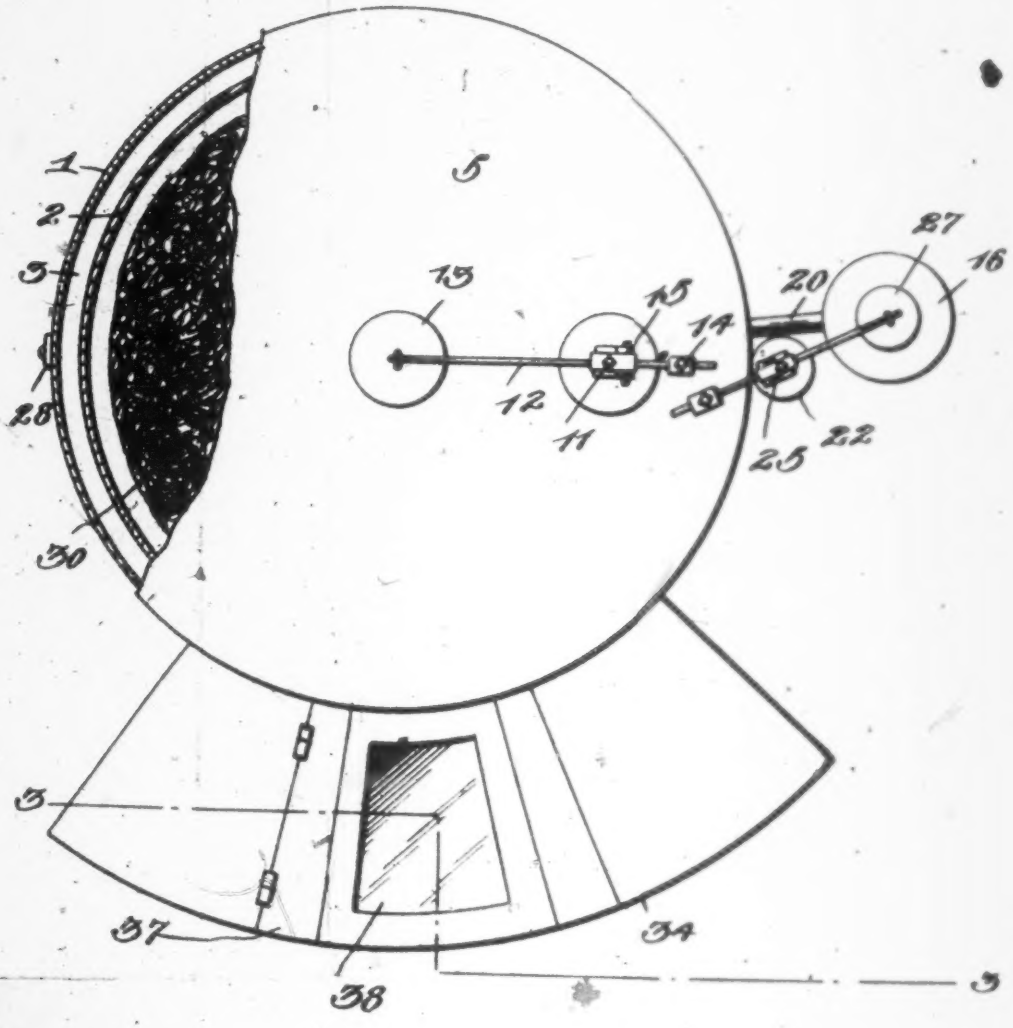
APPLICATION FILED DEC. 14, 1911.

1,075,747.

Patented Oct. 14, 1913.

3 SHEETS—SHEET 2.

Fig 2.



Witnesses
Chas. L. Griesbauer.
A. B. Norton.

Inventor
Cyrus W. Zimmer,
By Watson E. Coleman
Attorney

1254

C. W. ZIMMER.

SEMIFIBELESS INCUBATOR.

APPLICATION FILED DEC. 14, 1911.

1,075,747.

Patented Oct. 14, 1913.

3 SHEETS—SHEET 3.

Fig. 3.

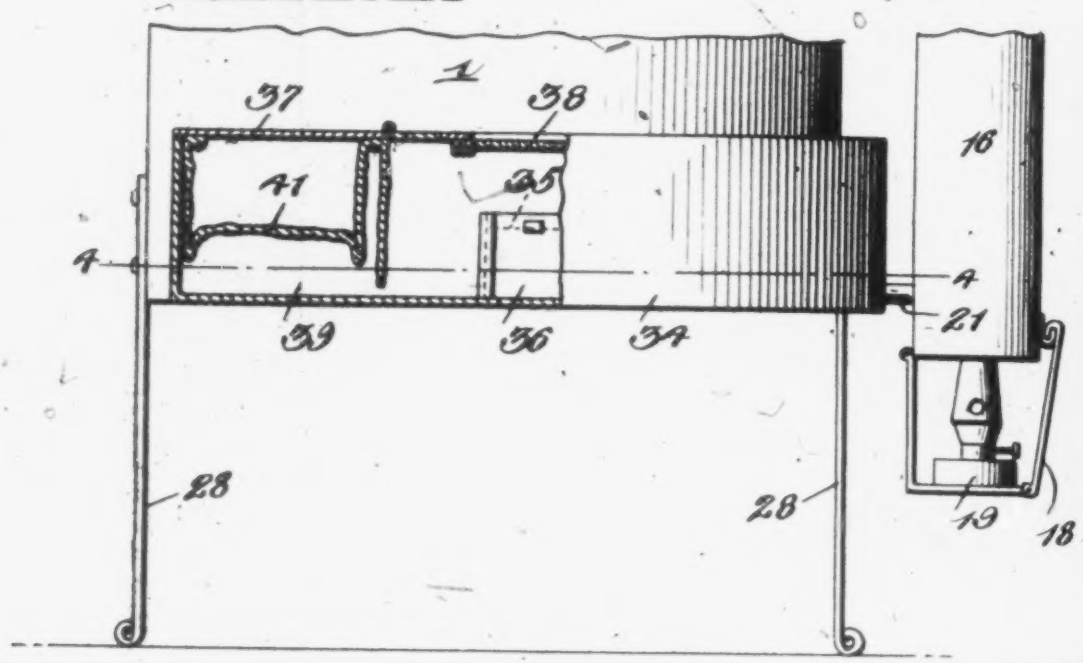
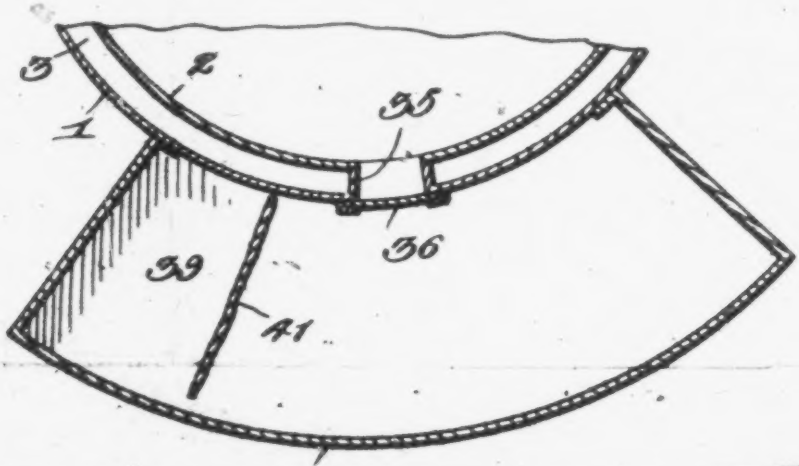


Fig. 4.



1,076,141. Patented Oct. 14, 1913.

3 SHEETS—SHEET 3.

Fig. 3.

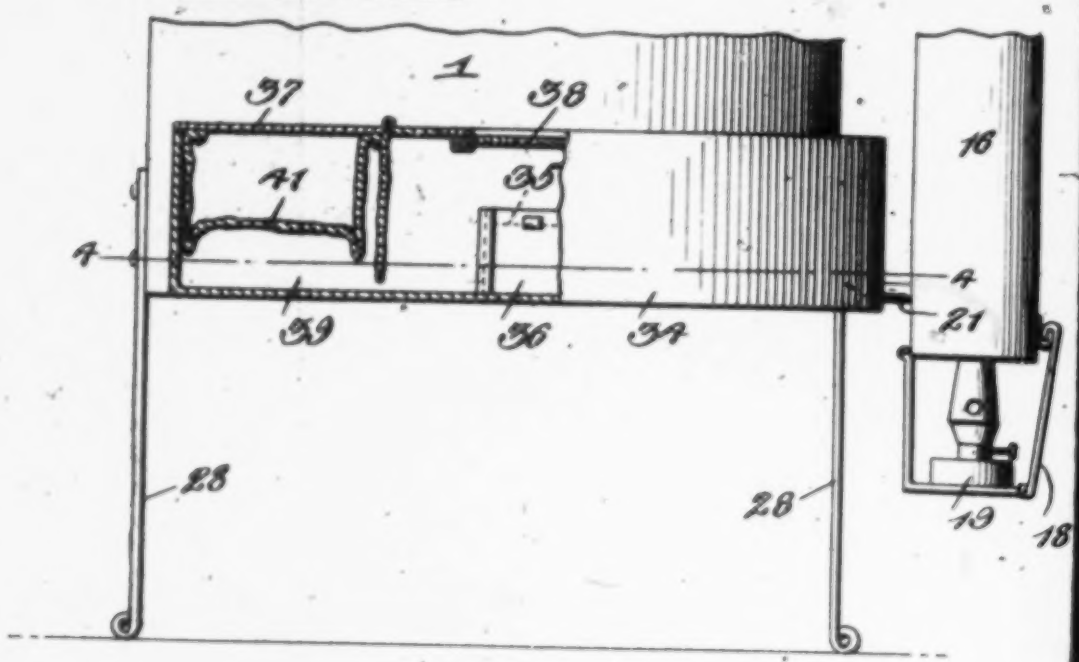
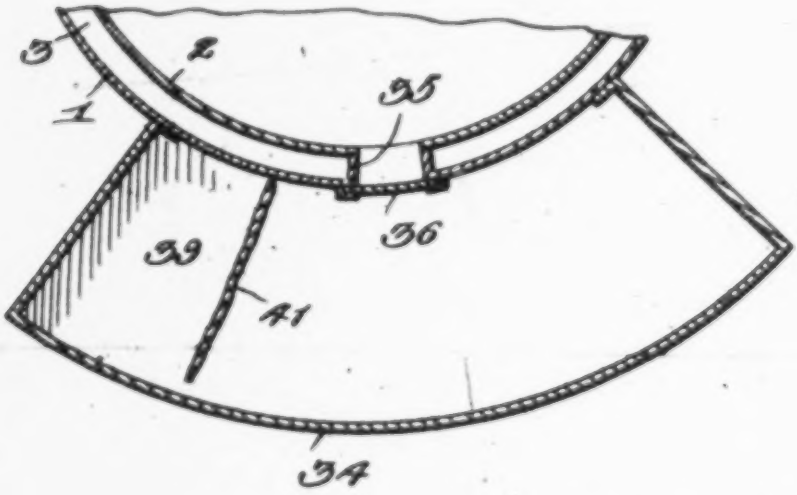


Fig. 4.



Inventor

Cyrus W. Zimmer,

By Watson E. Coleman

Attorney

Witnesses

Alex. L. Griesbauer.

G. B. Norton.

UNITED STATES PATENT OFFICE.

CYRUS W. ZIMMER, OF NEW YORK, N. Y.

SEMIFIRELESS INCUBATOR.

1,075,747. Specification of Letters Patent. Patented Oct. 14, 1913.

Application filed December 14, 1911. Serial No. 665,653.

To all whom it may concern:

Be it known that I, CYRUS W. ZIMMER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Semifireless Incubators, of which the following is a specification, reference being had to the accompanying drawings.

This invention is an improved incubator which I term a semi-fireless incubator and by means of which the animal heat of the eggs which, after having been partially incubated by artificially or externally applied heat may be utilized for incubating other eggs, supplied to the incubator from time to time, one object of my invention being to effect improvements in the construction of the incubator, whereby a uniformity of heat may be maintained.

The invention further consists in the construction, combination and arrangement of devices hereinafter described and claimed.

In the accompanying drawings: Figure 1 is a vertical sectional view of an incubator constructed in accordance with my invention; Fig. 2 is a plan view of the device with parts broken away. Fig. 3 is an elevation, partly in section of my improved incubator, showing a nursery on one side thereof, the nursery being indicated in section; and Fig. 4 is a fragmentary horizontal section through the device as seen on line 4—4, Fig. 3.

The body of my improved incubator comprises an outer shell or casing 1, here shown as cylindrical in form, and an inner vessel 2 which corresponds in shape with and is somewhat smaller than the outer shell and is spaced from the sides and bottom of the latter so that a water space 3 is formed between the bottoms and also between the side walls of the outer and inner vessels. These vessels are preferably made of sheet metal, but may be made of any suitable material.

suitable bracket or hanger. This thermostatic wafer actuates a pin 10 which operates in a small hole in the cover and is in contact with an adjusting screw 11 carried by a weighted lever 12, which lever has a damper 13 connected to its longer end and disposed over the opening 7, the weight 14 being at the shorter end of the arm of the lever, and the latter being pivotally mounted between a pair of ears 15 with which the cover is provided. At one side of the body of the incubator is a heater 16 which comprises a water jacketed flue 17, at the lower end of which is a carrier 18 for a suitable lamp 19. The water jacket of the flue 17 is connected to the water space of the body of the incubator by a flow pipe 20 and a return pipe 21. Hence, the water which is heated by the action of the lamp in the water jacket of the flue passes into the water space of the body of the incubator and the cooler water from the latter returns back, through the return pipe 21, into the water jacketed heating flue and hence a constant circulation of heated water is maintained throughout the water jacketed heating flue and the water space of the incubator and the temperature in the incubating chamber of the latter is kept substantially uniform.

That portion of the flow pipe 20 within the incubator is provided with two curved branches 20^a, which extend partly around in the water space 3, the two branches, in practice, extending about two-thirds the circumference of the incubator. This pipe carries the water in opposite directions about two-thirds of the way around the incubator and the open ends of the branches permit the water from said pipe to flow into and mingle with the water in the water space. Openings 20^b are also provided in these branches to permit of the partial escape of the heated water at different points around the incubator. These openings are of such size and number and are so located as to

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A vertical pipe 22 leads from one side of the water space of the incubator body and is filled with water therefrom, and in this pipe is placed a thermostatic wafer 23 which is similar to the wafer 8 hereinbefore described and, through the instrumentality of a pin 24, operates a weighted lever 25, the longer arm of which is connected, by a wire 26, to a damper 27 which operates at the upper end of the water jacketed flue.

The wafer 9, in connection with the damper 13 of the incubating chamber, constitutes an auxiliary regulator, located on the lid of the incubator, which serves to allow the operator to permit a certain amount of ventilation for the incubating eggs all of the time, which ventilation may be increased or decreased at will. The auxiliary regulator also prevents the chicks from being killed by being overheated, in the event that the regulator for the heating apparatus should fail to operate.

The thermostatic wafer 23, in connection with the damper 27, directly controls the draft from the lamp and, hence, also the heating efficiency of the water jacketed flue and, thereby, my improved incubator is doubly regulated as to its temperature and hence I am enabled to readily maintain the required even temperature in the incubating chamber. Moreover, the incubating chamber is automatically ventilated, as will be understood. Suitable supporting legs such as are indicated at 28 are provided for the body of the incubator to support the same at the desired distance above the floor.

In practice, my incubator is preferably made of such size as to provide a capacity for a thousand eggs, the inner diameter of the inner vessel 2, which constitutes the incubating chamber, being twenty-two inches and the height thereof twenty-eight inches. The incubator may, however, be made of any size desired.

A series of removable egg trays 29 is also provided and a series of mats 30 which are preferably feather mats. The trays are made of wire mesh and each is provided with a metal rim 31. The diameter of the trays is less than that of the incubating chamber. In practice, where the incubating chamber is twenty-four inches in diameter I make the trays twenty-two inches in diam-

around the layers of eggs, and I may also place a thermometer 44 in each egg tray, with the eggs under the feather mats, hence enabling the operator to know the temperature of the water which heats the incubator, the temperature of the air in the incubating chamber surrounding the eggs, as well as the temperature of the eggs in each and every tray.

In the operation of my incubator, and by my improved method of hatching, I introduce a layer of eggs, progressively from day to day. On the first day a layer of eggs is placed directly in the bottom of the incubating chamber, after the incubator has been artificially heated and while the heating apparatus is in operation, and a feather mat is placed on said layer. On the second day another layer is placed in the bottom of the incubating chamber, the first layer being placed in one of the trays and disposed on the new layer, and separated therefrom by a feather mat and also covered by another feather mat. I continue this process from day to day, supplying a new layer each day at the bottom of the incubating chamber and raising the other layers, so that the layers are disposed in the order of their ages, with the oldest eggs on top. I continue this for ten consecutive days. During this period the incubator is artificially heated and is kept at the usual incubating temperature, and I continue this artificial heating for two days longer, or until the twelfth day is reached and the upper layer of eggs is twelve days old in point of incubation. By this time incubation has so far progressed in the eggs of the upper layer that there is circulation of blood in the embryos of that layer and the said layer gives off considerable animal heat. At this point in the period of incubation the lamp is extinguished and the incubator allowed to cool gradually, and when it has become partially cooled all the trays containing the eggs are taken out of the incubator and a mat of feathers is placed on the bottom of the incubating chamber. The eggs are now replaced in the incubating chamber in reverse order to the former arrangement, that is to say, the oldest eggs in point of incubation are placed in first, at the bottom of the superimposed trays or layers of eggs, the newest eggs being on top. Hence the eggs in which

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In practice I employ a thermometer 41, in the pipe 22, suspended therein and submerged in the water. The pipe has a glazed opening 42 in one side, through which the said thermometer may be inspected. I also, when the incubator is in operation, use thermometers 43, suspended in the incubating chamber at different heights in the space the temperature of the eggs in each and every tray.

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It will be understood that each layer of eggs supports the weight of the eggs in the

upper layers and that the eggs in the bottom layer in which the process of incubation is the most advanced, support the weight of all the other eggs. The heat of the hatching eggs causes them to expand and apply pressure to the shells, thus tending to disintegrate the shells, and this disintegrating process is greatly promoted and facilitated by the weight of the superincumbent layers of eggs, the weight tending to flatten the lower eggs, change the shape of their shells and, hence, aiding in their decomposition and rendering them somewhat more brittle. This enables the chicks, when the hatching is complete, to be liberated more easily.

When the day arrives for the hatching of the lowest layer of eggs, said layer is relieved of the weight of the other layers. To effect this, the other layers are removed, a support is placed in the bottom of the incubator, and the layers of eggs are then replaced in the same order as before.

A suitable support is shown in Fig. 1 and comprises a circular form 32 having a series, say about six, of supporting legs 33. The height of this support is such that it forms a space of about an inch above the bottom layer and below the next lowest layer, thereby providing room for the chickens to hatch at the bottom of the incubator.

I also provide a nursery 34 for the newly hatched chickens. This nursery is on one side of the incubator, directly in contact therewith and is reached by the chicks through an opening 35 with which the incubator is provided, there being a slide 36 to cover this opening when desired. The nursery has a lid 37 provided with a glazed opening 38 which admits light thereto. The chicks after hatching and becoming strong enough to run around, see and are attracted by this light, which also shines through the opening 35, and go into the nursery chamber, where gravel would be placed on the floor. At one end of the nursery is a hover chamber 39, curtained off, as at 40, and provided with a hover blanket 41, suspended from the top, under which the chicks can cuddle for warmth, a considerable degree of heat being supplied by the warm air which comes in from the incubating chamber. The lid of the nursery [illegible]

The feather mats which I employ in my incubator to cover the layers of eggs serve to retain heat and also to ventilate the eggs and closely approach natural conditions. By making the egg trays of less diameter than the incubator chamber in which they are placed the eggs in the incubator chamber are kept surrounded on all sides by the air in the incubator chamber and, hence, they are effectually ventilated.

The construction of my improved fireless incubator is such that the operator has a wide control over the necessary conditions for successful incubation, in that he can vary the number of cover mats over the eggs in the incubating chamber as may be required to retain the necessary heat and moisture in the incubating chamber under varying conditions, as to locality, altitude, heat and cold, and the season of the year.

Having thus described my invention I claim:

An incubator comprising an outer casing, an inner casing spaced from the latter to provide a water space between the sides and bottoms of the same, a vertical pipe disposed outside of the outer casing and having the lower end thereof communicating with said water space intermediate the upper and lower ends thereof, said pipe extending to a point above the top of the outer casing and adapted to contain water to the same height as that in the water space, means to heat and maintain circulation in said water space including a heater, and a flue in connection therewith disposed beyond the outer casing, a damper for said flue, a thermostatic wafer disposed in said pipe from the top thereof to be partially immersed in the water therein, means in connection with the upper end of said wafer and said damper for thermostatically regulating the latter, whereby to regulate the heating of the water in the water space, a removable top applied to the upper ends of said casings, said top being provided with a damper, and additional means carried by said top and actuated by the heat units in the inner casing for thermostatically regulating the last mentioned damper.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

CYRUS W. ZIMMER.

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Witnesses:
HERBERT D. COHEN,
JEREMIAH O. CROWLEY.

[fol. 1553] UNITED STATES DISTRICT COURT

[Title omitted]

OPINION—Filed June 28, 1935

Appearances:

Albert L. Ely, Max D. Farmer, Attorneys for Plaintiff; Ely & Barrow; Parker, Prochnow & Farmer, of Counsel.

Toulmin & Toulmin, Attorneys for Defendants; John S. Powers, of Counsel.

KNIGHT, District Judge:

Patent No. 1,262,860 was issued to Samuel B. Smith, assigned to Buckeye Incubator Company, hereinafter referred to as "Buckeye", and reassigned to Smith subject to a license to Buckeye granting "the full and exclusive right, [fol. 1554] liberty and license to make, use and sell in and throughout the United States • • • incubators embodying the invention shown, described and claimed in said Letters Patent • • •." The exclusive license granted was limited to "incubators in which the total egg and chick holding capacity • • • shall not exceed 16,500 eggs." The assignment to Smith included the right to the recovery of damages and profits for past infringements. By agreement executed on the same date and made a part of the assignment by reference, Smith was given the right to prosecute all infringers, paying all expenses of prosecution and receiving all recoveries therefrom except that Buckeye was to be reimbursed for expenses incurred in pending suits. This action was brought to restrain further infringement of the patent and to fix the damages incurred by reason of alleged past infringement.

At the close of the trial defendant moved for dismissal of the action on the ground of absence of a necessary party and plaintiff's failure to prove title.

Defendant asserts that the Buckeye Incubator Company is co-owner of the patent in suit; that the Buckeye Incubator Company would be injuriously affected by continuance of the suit and would be entitled to institute another suit against the defendants based on the rights acquired under the license agreement.

The Buckeye Company is a necessary party in this action only if it is a co-owner or exclusive licensee. Smith relies upon the assignment to show that Buckeye is not a co-owner. The assignment provided that the Letters Patent were "to [fol. 1555] be held and enjoyed by the said Smith, his heirs and assigns as fully and completely as the same would have been held and enjoyed by said Buckeye Incubator Company had this assignment not been made".

Defendant claims that Buckeye is a co-owner for the reason that it holds exclusive license to make, use and sell incubators having a capacity not exceeding 16,500 eggs and as an exclusive licensee must be joined in the action. It is also contended that plaintiff may not make, use or sell incubators of less than the above mentioned capacity and is not damaged by defendant's invasion of that field.

The assignment from Buckeye to Smith precludes a finding that they are co-owners of title to the patent. The assignment is properly drawn and purports to convey the entire title, reserving only a license to the assignor. Nor need Buckeye be joined as a party as a co-owner by reason of its exclusive license to produce the smaller sizes of incubators under the patent. The license to Buckeye was a license covering less than the whole of the patent. To require joinder as a party a license must cover the entire scope of the patent. In Radio Corp. of America v. Emerson, 296 F. 51, the license granted covered the entire monopoly of the patent but restricted the field of uses between amateur and commercial fields. Independent Wireless Telegraph Co. v. Radio Corp. of America, 269 U. S. 459, was a similar case. Defendant quotes from Crown Die & Tool Co. v. Nye Tool & Mach. Works, 261 U. S. 24, a part of a quotation from Waterman v. MacKenzie, 138 U. S. 252, in which it is said that the patentee or his assigns may transfer an undivided part or [fol. 1556] share of the exclusive right to make, use and vend the invention and that such a transfer is an assignment vesting in the assignee a title in so much of the patent itself with a right to sue infringers. With that principle this Court is in accord. It does not accord with the defendant's assertion that the license here in question is a transfer of an undivided part or share of the exclusive right given by the patent. Here the right is to use the patent to a limited degree only, and therefore cannot be an undivided part or share of the entire patent right.

The following paragraph from Gayler v. Wilder, 10 Howard 477, bears directly on the issue: "by the 11th section of the Act of 1836 the patentee may assign his whole interest or an undivided part of it; but if he assigns a part under this section, it must be an undivided portion of his entire interest under the patent placing the assignee upon equal footing with himself for the part assigned. Upon such an assignment the patentee and his assignees become joint owners of his whole interest secured by the patent according to the respective proportions which the assignment creates". I find, therefore, that the license to Buckeye was a license less than exclusive and that the Buckeye Incubator Company need not be joined as a party in this action. This accords with the finding of Judge Hincks, of the District Court of Connecticut in Smith v. Hall, et al., on motion for preliminary injunction, decided February 27, 1935, and Judge Molyneaux of the District Court of Minnesota, in Smith v. Street, et al., supra.

It is claimed by defendant that plaintiff has not proved [fol. 1557] ownership of title to the patent. Defendant's position is that since the assignment and contract bear even date and the former recites that it was executed at Springfield, Ohio, and the latter recites that it was executed at Columbus, Ohio, and the witness who testified to seeing them both signed did not testify to meetings in the two cities on that date, his testimony is insufficient to prove the execution. Plaintiff's witness testified that he was present acting as attorney for Mr. Smith when the papers were executed and that he recognized the signatures on the documents introduced as signatures he saw made at that time. This testimony is sufficient to prove execution of the documents and such execution having been proved, proof of title in the plaintiff has been sufficiently made. The variance in the documents as to the place of execution is immaterial. Had no place of execution been mentioned, the assignment and the contract would have been no less valid. Statement of the place of execution was a non-operative and unnecessary formality and an error in one of the documents as to such place of execution will not defeat the intention of the parties inasmuch as direct proof of the execution of the documents was offered. Since no attempt was made to prove them as documents of public record, the cases cited by defendant in regard to acknowledgment before a notary

or other qualified officer are not applicable. The motion for dismissal is denied.

Claims 1, 2, 3 and 5 are in issue. Defendant offers the usual defenses of invalidity and non-infringement. The patent has been in litigation many times, and the validity [fol. 1558] has been upheld in each instance where questioned. Buckeye v. Wolf, 291 F. 253, affrd. 296 F. 680; Buckeye & Smith v. Cooley, D. C. of N. J., April 23, 1925, affrd. 17 F. (2d) 453; Buckeye v. Petersime, D. C. S. Ohio, September 17, 1926; affrd. 19 F. (2d) 721; Buckeye v. Blum, 17 F. (2d) 456; affrd. 27 F. (2d) 333; Buckeye v. Hillpot, 22 F. (2d) 855; affrd. 24 F. (2d) 341; Snow, et al. v. Smith, 70 F. (2d) 564; reversed on other grounds, Smith v. Snow, 294 U. S. 1; Smith v. Street, et al., D. C. of Minn., May 1, 1935; Smith v. Simms, et al., D. C. of S. D. of Ind.; March 8, 1935; Waxham v. Smith & Buckeye, 70 F. (2d) 457; affrd. 294 U. S. 20; Buckeye v. Miller Hatcheries, D. C. E. D. of Mo., March 6, 1929; affrd. 41 F. (2d) 619; Bolling v. Buckeye, 33 F. (2d) 347; reversed on other grounds 46 F. (2d) 965; Smith & Buckeye v. Jensma, et al., 1 F. Supp. 999. This Court also is of the opinion that the patent is valid.

In support of its defense of non-infringement the defendant puts forward as differences between its product and the patent structure that it uses a separate hatcher for the last three days of the hatching period thereby failing to use the complete result of the process and that it uses the principle of agitation to circulate the air rather than the forced current of the patent.

The defense of agitation of air was used in Smith v. Snow, supra. There the infringing device had fans or propellers located at either side of the chamber about mid way of its height, near the wall and between the wall and tiers of egg trays. The air was thrown off the ends of the propeller blades toward the top, bottom and adjacent ends of the [fol. 1559] chamber, deflected by the ceiling, floors and ends of the chamber into a central corridor and drawn through the tiers of eggs to the propellers, moving continuously under the impetus of the constant operation of the propellers. The Supreme Court rejected the contention that the air "goes where it 'listeth' ", finding "that there is a continuous movement of air from the blades of respondent's propellers toward the top and bottom and sides of the chamber thence to the corridor and thence through the tiers

of egg trays back to the propellers and that this movement achieves the purpose • • • 'to circulate, diffuse and maintain the air throughout the chamber at substantially the same temperature.' • • • That there is a mixture of the air and some confusion of its movement in the corridor, and that at different levels within the space occupied by the tiers of trays the movement is not in the same direction, is immaterial."

Defendant's device is so constructed that the air is drawn upward through the tiers of egg trays to the top of the cabinet where it is thrown from the tips of the impeller blades toward the front and back of the compartment and carried downward through channels to the base of the compartment. At this point defendant has provided its device with a turbulator or agitator, a flat blade rotating air mixer which revolves at a slower rate of speed than the impeller. The purposes are to mix the fresh air which comes in at the base of the machine into the flow of air within the machine so as to secure an even temperature throughout the compartment, and to break up the current of air so that as it rises through the tiers of egg trays it will have no defined [fol. 1560] path. In plaintiff's device the fresh air is mixed into the air flow of the machine by the propeller. This is impracticable in defendant's machine, because the impeller is at the top while the fresh air inlets are at the base of the machine. Experiments at the trial showed that the turbulator affected air currents in only a few of the lowest trays of eggs and that from that point upward the air flow tended to travel in definite paths. In Smith vs. Snow, supra, it was stated that the claim does not require "that the propelled current • • • should be guided, controlled or directed by any particular means or in any particular manner other than it should be of sufficient velocity to produce the results prescribed by the claim". The claim prescribes that the current shall be "of sufficient velocity to circulate, diffuse and maintain the air throughout the chamber at substantially the same temperature". It is obvious that the defendant has a current of air in its device inasmuch as the air passes and re-passes over the eggs being replaced by fresh air to the extent of 1 to 3 per cent. only with each circuit of the chamber. The air flow is a current in a manner to bring it within the claims of the patent despite the fact that it is churned at one point in the circuit. The

operation of the defendant's device is such that the current is of sufficient velocity to circulate, diffuse and maintain the air throughout the chamber at substantially the same temperature.

The defendant would require an agitator in its device regardless of any purpose to break up the flow of the current of air in the chamber, since its inlets for fresh air are at the base of the machine and the flow of fresh air into the [fol. 1561] machine would not be broken up until it reached the top of the chamber after passing through the tiers of egg trays, thus subjecting certain of the eggs to a cooling air current. Thus the so-called agitator is primarily a mixer. That it incidentally churns the air so that the even flow is disarranged at one point in the circuit is insufficient to take the device without the scope of the patent. Plaintiff by placing its inlets over the propeller immediately breaks up the flow of fresh air into the machine and needs no second mixing device. It appears to this Court that the defendant is attempting to avoid infringement of the method claims 1, 2 and 3 of the patent, merely by varying the details of the apparatus by which they make use of them, which, of course, is not to be permitted. Snow v. Smith, supra; citing Cochrane v. Deener, 94 U. S. 780, at 788; Tilghman v. Proctor, 102 U. S. 707, at 730 and 731. See also Waxham v. Smith, supra, and cases there cited. Defendant also infringes the structural claim, claim 5 of the patent, since his device reads directly under the claim.

There is no question but that the defendant uses the method of the Smith patent up to the time that the eggs are removed to a separate compartment for the last three days of the incubation period and the emergence of the chick. The removal of the eggs previous to the completion of the incubation period will not avoid infringement, the defendant having used the principles of the Smith invention but to less than their full extent. Mills Novelty Co. v. Monarch Tool & Mfg. Co., 76 F. (2d) 653; Telescope Cot Bed Co. v. Gold Metal Camp Furniture Co., 229 F. 1002; Nachman Spring-Filled Corp. v. Spring Products Corp., [fol. 1562] 68 F. (2d) 829. This defense was rejected also in Smith v. Hall, supra, and Smith v. Simms, supra.

The patent is valid and infringed. The plaintiff may have an accounting for damages resulting from the infringe-

ment. Findings of Fact which may be submitted will be considered a part of this opinion.

John Knight, United States District Judge.

June 28, 1935.

IN THE UNITED STATES DISTRICT COURT

[Title omitted]

FINDINGS OF FACT AND CONCLUSIONS OF LAW—Filed July 5, 1935

This cause having come on for hearing and having been [fol. 1563] heard in open Court and upon arguments and briefs submitted by counsel for the parties, and this Court being fully advised in the premises now states the following:

Findings of Fact

(1) The patent in suit was assigned by the plaintiff Samuel B. Smith to The Buckeye Incubator Company, which Company reassigned the patent to the plaintiff by assignment dated April 29, 1927, the Buckeye Company being granted, by an instrument of the same date, the exclusive license to manufacture and sell incubators not to exceed 16,500 egg capacity.

(2) The said assignment of April 29, 1927, granted to the plaintiff the right to the recovery of damages and profits for past infringement, and by an agreement of the same date the plaintiff was given the right to prosecute all infringers, paying all expenses thereof and receiving all recoveries.

(3) The Buckeye Company is not a co-owner of the patent in suit, nor is it the owner of an undivided part or share of the entire patent right, but was the mere owner of a license less than exclusive.

(4) That the plaintiff, Samuel B. Smith, is the owner of the title to the patent in suit.

(5) That the defendant, James Manufacturing Company, is a corporation of Wisconsin, and has and maintains

a regular and established office and place of business at Elmira, New York, within the Western District of New [fol. 1564] York, wherein, and elsewhere, it is and has been, for a period within six years prior to the filing of the Bill of Complaint, engaged in the manufacture and sale of Incubators.

(6) That the defendant, Elmira Hatcheries, Inc., is a corporation of New York, located and doing business at Elmira, New York, within the Western District of New York, where it is engaged in the commercial incubation and hatching of eggs.

(7) By stipulation of counsel, suits against the said defendants have been consolidated.

(8) Claims 1, 2, 3 and 5 are charged to be infringed by the manufacture, sale and use of "Jamesway Incubators".

(9) That none of the prior art patents or publications, or none of the alleged prior uses, including the so-called Hastings' prior use, anticipate either the process or apparatus of the patent, and that the patent and claims 1, 2, 3 and 5 thereof are valid.

(10) That the defendants do not avoid infringement of claims 1, 2 and 3 by the use of a separate hatcher for the last three days of the hatching period, for the defendants use the method of the Smith patent up to the time that the eggs are removed to a separate compartment for the last three days of the incubation period and the emergence of the chick.

(11) In defendants' incubators the air is propelled in [fol. 1565] current form by impellers which throw the air toward the front and back of the compartment, from whence it is carried through channels to the base and drawn back through the egg compartment in a continuous circuit, the air being replaced by from 1 to 3 percent. of fresh air in each circuit.

(12) The defendants do not avoid infringement by the presence of the agitator at the base of the incubating cabinet, the purpose of which is to mix the incoming fresh air with the circulating heated air, and that, while this agitator incidentally churns the air at one point in the circuit, the defendants' incubators have a current movement of air

over the eggs, and any departure from the general current movement is at a few points only and is immaterial.

(13) That the structure of defendants' incubators reads directly upon claim 5 of the patent.

Conclusions of Law

I

The patent in suit is valid.

The plaintiff, Samuel B. Smith, is the owner of the patent, and The Buckeye Incubator Company is the owner of a license less than exclusive.

III

That The Buckeye Incubator Company is not a co-owner of the patent and is not a necessary party, and defendants' motion to dismiss based upon such allegations, is denied.

[fol. 1566]

IV

The defendant, James Manufacturing Company, has infringed upon claims 1, 2, 3 and 5 by the manufacture and sale in this District, and elsewhere, incubators known as the "Jamesway Incubators".

V

That the defendant, Elmira Hatcheries, Inc., has infringed upon Claims 1, 2, 3 and 5 by the use in this District, of incubators known as the "Jamesway Incubators".

VI

That a decree shall be entered herein finding the patent in suit unanticipated, valid, and claims 1, 2, 3 and 5 hereof infringed.

VII

The patent in suit having expired April 16, 1935, no injunction shall issue.

John Knight, U. S. D. J.

July —, 1935.

[fol. 1567] IN THE UNITED STATES DISTRICT COURT

[Title omitted]

INTERLOCUTORY DECREE—Filed July 18, 1935

In accordance with the Opinion and Findings of Fact and Conclusions of Law entered in this cause today, it is hereby Ordered, Adjudged and Decreed:

I

That the patent in suit No. 1,262,860 is valid particularly as to claims 1, 2, 3 and 5 thereof, and that plaintiff was the first, original and sole inventor thereof.

II

That defendants' motions to dismiss on the grounds that title was not proved and that The Buckeye Incubator Company was not made a party, are dismissed.

[fol. 1568] III

That the defendant, James Manufacturing Company, has infringed upon claims 1, 2, 3 and 5 thereof, by the manufacture and sale of "Jamesway Incubators".

IV

That the defendant, Elmira Hatcheries, Inc., has infringed upon claims 1, 2, 3 and 5 thereof, by the use of "Jamesway Incubators".

V

That the plaintiff recover from defendants the profits, gains and advantages which defendants have each and severally derived or received by reason of the aforesaid infringements, and that the plaintiff recover all damages sustained by reason thereof.

VI

That this case be referred to — as Special Master in Chancery, to take evidence and to make his report and findings of the defendants' gains, advantages and profits due to the manufacture, sale and use of the Jamesway incubators found to be an infringement herein, and of the plain-

tiff's damages occasioned by the said infringements, and to make such reports and findings in the premises as may appear proper and just.

VII

That the plaintiff recover from the defendants the costs herein to be taxed and have judgment and execution therefor.

John Knight, U. S. D. J.

July 18, 1935.

[fol. 1569] UNITED STATES DISTRICT COURT

[Title omitted]

PETITION FOR APPEAL

The above named defendants, James Manufacturing Company and Elmira Hatcheries, Inc., feeling themselves aggrieved by the decree filed herein on or about July 18, 1935, hereby appeal from said decree to the United States Circuit Court of Appeals for the Second Circuit, for the reasons specified in the assignment of errors which is filed herewith; and pray that this appeal may be allowed and that citation issue as provided by law.

Toulmin and Toulmin, Counsel for Plaintiff. John S. Powers, Solicitor for Plaintiff.

[fol. 1570] UNITED STATES DISTRICT COURT

[Title omitted]

ORDER ALLOWING APPEAL

These causes coming on to be heard upon defendants' prayer for an appeal to the United States Circuit Court of Appeals for the Second Judicial Circuit from the interlocutory decree entered herein by this Court on or about the 18th day of July, 1935, and the defendants having filed their assignment of errors in due form with said prayer for appeal:

It is Ordered that said prayer be and the same is hereby allowed upon defendants filing herein the usual appeal bond in the sum of $1500.00, to be filed within five days from the date hereof.

It is Further Ordered that accounting proceedings provided for in the above interlocutory decree be and the same hereby are suspended, pending the disposition of said appeal.

John Knight, United States Judge.

Dated August 13, 1935.

[fol. 1571] UNITED STATES DISTRICT COURT

[Title omitted]

ASSIGNMENTS OF ERROR

Now comes the James Manufacturing Company and Elmira Hatcheries, Inc., defendants, in the above-entitled case, by their counsel, and, having prayed for an appeal to the United States Circuit Court of Appeals for the Second Circuit from the judgment and decree entered in this case by the District Court for the Western District of New York, on or about the 18th day of July, 1935, which adjudicates that the plaintiff's patent is valid and that claims 1, 2, 3 and 5 have been infringed by defendants, now say that said decree and judgment are erroneous and against the just rights of said defendants for the following reasons:

Court's Findings of Fact

1. That the District Court erred in Finding 2 that plaintiff could recover profits and damages from defendants in [fol. 1572] this case, by reason of an agreement of date April 29, 1927, between the plaintiff and his licensee, The Buckeye Incubator Company; whereas when plaintiff brought this suit he had parted with all interest and rights under the patent in suit as to incubators of capacity of 16,500 eggs and less; and whereas these defendants' incubators involved herein were all of egg capacity under 16,500—usually averaging about 5,000 eggs capacity in each incubator.

2. That the District Court erred in Finding 3 that The Buckeye Incubator Company, plaintiff's said licensee, was not a co-owner in the patent in suit, nor the owner of an undivided part or share in the entire patent, but was a "mere owner of a license less than exclusive"; whereas all right, title and interest in the patent in suit as to the exclusive manufacture, use and/or sale of incubators of egg capacity of 16,500 eggs, and less, covered by the patent to Samuel B. Smith, Smith conveyed away, prior to the suit, to The Buckeye Incubator Company in and by its said exclusive license, then and now in full force and effect.

3. That the District Court erred in its Finding 4 to the effect that Smith, the plaintiff, "is the owner of the title to the patent in suit"; whereas Smith is not the owner of any right of manufacture, use and/or sale of incubators covered by the patent of capacity of 16,500 eggs or less, in each machine; and whereas also this license from Smith to The Buckeye Incubator Company was in legal effect an assignment of an interest in the patent for that it was ex-
[fol. 1573] clusive of the patentee and all others as to machines of 16,500 egg capacity or less.

4. That the District Court in Finding 9 erred in finding the Smith patent and claims 1, 2, 3 and 5 thereof were valid over the prior art and prior uses proved in this case; whereas the Court should have found on the evidence in this case that particularly, the Hastings prior use, and the prior patents and/or publications proved in defense, were sufficient to have required a contrary finding.

5. That the District Court erred in Finding 10 holding that defendants did not avoid infringement of claims 1, 2 and 3 of the patent in suit by the use of a Separate Hatcher or apparatus within which to hatch the chickens after the period of incubation; where as defendants merely incubated the eggs in their incubators for the incubating period of 17 to 18 days; and did not carry the heat arising from the eggs in the later hatching stage to the eggs in and during the incubation period, as done in the Smith patent; and whereas the Separate Hatcher of defendants has no communication with their incubator, and forms no part thereof, but is a separate structure; and whereas also any of the diseases that commonly arise during the hatching period, are prevented from reaching and infecting the eggs during

the incubation period because of defendants' Separate Hatcher, and because of their method of incubating and hatching being performed in non-communicating structures.

6. That the District Court erred in its Finding 11 to the effect that in defendants' incubators the air was propelled [fol. 1574] in currents, and that these currents passed amongst the eggs in the incubating chamber, and moved in that chamber back and forth in a "continuous circuit"; whereas in defendants' method and apparatus the air moved through the incubating chamber in a state of agitation, churning, or commotion, which numerous United States Circuit Courts of Appeal have decided was not the method of the Smith patent; and whereas also in defendants' apparatus the eggs during the hatching period of three days are not subjected to any air movements at all, the air in the Separate Hatcher being quiet and undisturbed, and cut off from reaching the eggs under incubation or from carrying to the incubating eggs any diseases from this Separate Hatcher.

7. That the District Court erred in its Finding 12 to the effect that defendants do not avoid infringement by their air agitator in the incubating cabinet, the purpose of which is to mix the incoming fresh air with the circulating heated air, and that while defendants' agitator churns the air at one point, still that defendants' incubators have a current of air which moves over the eggs; whereas in defendants' incubator the air amongst the eggs and in the egg trays is in an agitated, churned or stirred condition, without any defined movement at all, as in the case of currents driven by high speed pressure fans; and whereas the air in its hatcher is not moved at all by any mechanical means and is not allowed to communicate with the eggs in the incubating apparatus because of the transmission of diseases which arise during the hatching period; separate [fol. 1575] hatching being the advantageous prevailing method which has arisen long after the Smith patent was issued.

8. That the District Court in its Finding 13 erred in stating that the structure of defendants' incubators "reads" directly on Claim 5 of the patent in suit.

Conclusions of Law

9. That the Court erred in Conclusion I to the effect that the patent in suit is valid; whereas on the record in this case it is invalid because of the fuller and more effective defenses contained in this record.

10. That the District Court erred in its Conclusion II that Samuel B. Smith is the owner of the patent and The Buckeye Incubator Co. is the owner of a "license less than exclusive"; whereas the fact is that said Smith has parted with that part of the ownership covered by the patent which relates to incubators each of the capacity of 16,500 eggs or less; and has granted an exclusive license to The Buckeye Incubator Co. as to the manufacture, use and sale of all such restricted capacity incubators.

11. That the District Court erred in its Conclusion III that The Buckeye Incubator Co. "is not a co-owner of the patent and is not a necessary party", with reference to which defendants' motion to dismiss upon these grounds was denied; whereas said licensee is a co-owner in the [fol. 1576] statutory property rights of the patent in respect to the exclusive and sole ownership as to manufacture, use and sale of incubators of said 16,500 egg capacity, or less.

12. That the District Court erred in its Conclusion IV that The James Manufacturing Company "has infringed upon claims 1, 2, 3 and 5, by the manufacture and sale" of incubators known as the "Jamesway" incubators; whereas claims 1, 2 and 3 are method claims relating to the operation of the machine of the Smith patent and can only be infringed by the use of an apparatus which practice such method; and whereas claim 5 is for the construction of an incubator which could only be infringed by the manufacture, sale or use of an apparatus substantially corresponding in construction with that embodied in the Smith patent, and having substantially the same mode of operation as the structure covered by claim 5 of the patent—all of which conditions are not true of these James incubators.

13. That the District Court erred in its Conclusion V that the defendant Elmira Hatcheries, Inc., has infringed claims 1, 2, 3 and 5 by the use of the Jamesway incubators;

whereas the Jamesway incubators do not operate according to the mode of operation called for in claims 1, 2 and 3, and are not of the structural construction set forth in claim 5, as the Jamesway incubators do not "hatch" chickens, as stated in said claims, but only incubate them, the hatching being performed in another apparatus not in communication with the incubator.

[fol. 1577] Opinion of the Court

14. That the District Court erred in its Opinion in holding that "The assignment from Buckeye to Smith precludes a finding that they are co-owners of title to the patent. The assignment is properly drawn and purports to convey the entire title, reserving only a license to the assignor"; whereas the license and assignment together constitute a co-ownership in the patent, divided thus: All the rights to Smith in the patent save the rights pertaining to the manufacture, sale and use of incubators of 16,500 egg capacity, or less; and all the rights in The Buckeye Incubator Company to manufacture, use and sell all incubators of the lesser capacities above stated. There are two title papers, not one only, as mentioned by the Court.

15. That the District Court erred in holding that The Buckeye Incubator Company, the licensee thus referred to, need not be joined as a party plaintiff and "co-owner by reason of its exclusive license to produce the smaller sizes of incubators under the patent"; whereas in this case no incubators of defendants come within the egg capacities reserved by Smith, but come only within the egg capacities conveyed away by Smith to his licensee.

16. That the District Court erred in holding adversely to defendants' position that the "license here in question is a transfer of an undivided part or share of the exclusive right given by the patent"; whereas letters patent comprise three classes of exclusive rights—the exclusive right [fol. 1578] to make, the exclusive right to use, and the exclusive right to sell, wherefore The Buckeye Incubator Company, the absent but necessary party, acquired an exclusive interest in all three of these rights as applied to incubators of 16,500 egg capacity or less.

17. That the District Court erred in holding: "I find, therefore, that the license to Buckeye was a license less

than exclusive and that the Buckeye Incubator Company need not be joined as a party in this action''; whereas under the exclusive license, The Buckeye Incubator Company was the sole owner of the three exclusive statutory rights, to make, use and sell the smaller sizes of incubators, as to which Smith is without any title.

18. That the District Court erred in holding that "• • • proof of title in the plaintiff has been sufficiently made''; whereas on this record there is no proof of any title in the plaintiff Smith to the patent with respect to the smaller sizes of incubators made and sold by defendants.

19. That the District Court erred in denying defendants' motion that the Bill be dismissed because "Plaintiff has no title'' to the patent in suit "except as to incubators which have egg capacities of more than 16,500 eggs''; whereas defendants' incubators are of egg capacity less than 16,500 eggs, to-wit, substantially 5,000.

20. That the District Court erred in holding that: "This court also is of the opinion that the patent is valid''; whereas the record in this case on behalf of the defendants [fol. 1579] is different in its facts and legal effect from the records in any of the preceding suits on the Smith patent here in question, with reference particularly to anticipating prior uses for the first time completely proved on this record.

21. That the District Court erred in its understanding and statement of the operation of defendants' incubators, to-wit: "Experiments at the trial showed that the turbulator affected air currents in only a few of the lowest trays of eggs and that from that point upward the air flow tended to travel in definite paths''; whereas the preponderance and weight of the evidence in this case, confirmed by the physical structure and mechanism of defendants' incubators, is that there are no defined or other currents of air which move "in definite paths'', or otherwise, in the incubating chamber of defendants' incubators, but, to the contrary, the air in the incubating chamber is stirred, churned, agitated, and put in general commotion, moving through the chamber in the nature of a cloud.

22. That the District Court erred in holding in its Opinion that: "The air flow (in defendants' incubators) is a current in a manner to bring it within the claims of the patent despite the fact that it is churned at one point in the circuit"; whereas the preponderance and weight of the oral evidence, and the physical mechanism and mode of operation in defendants' machine, established the contrary to this finding.

23. That the District Court erred in its Opinion in stating that: "It appears to this court that the defendant is at- [fol. 1580] tempting to avoid infringement of the method claims 1, 2 and 3 of the patent, merely by varying the details of the apparatus by which they make use of them, which, of course, is not to be permitted"; whereas, the alleged "details" of the "apparatus" of defendants are in structure and mode of operation so far different from the recitals and meaning of claims 1, 2 and 3, that the Government of the United States has granted letters patent No. 1,939,908, dated December 19, 1933, to George T. Markey, patentee, on these incubators of defendants, having found these incubators to be patentably different from the prior art including the patent here in suit.

24. That the District Court erred in its Opinion in stating that: "Defendant also infringes the structural claim, claim 5 of the patent, since his device reads directly under the claim"; whereas the combination of Smith's claim 5 is not to be found in defendants' incubators; and whereas defendants' incubators are the subject of independent patents granted by the Government of the United States.

25. That the District Court erred in its Opinion in holding: "There is no question but that the defendant uses the method of the Smith patent up to the time that the eggs are removed to a separate compartment for the *last three days of the incubation period* and the emergence of the chick"; whereas (a) there is no incubation process after the 17½th to 18th day, as the chicks are then a complete and living organism and need only to (b) grow, and (c) crack their shells and emerge. Steps (b) and (c) are [fol. 1581] not performed in defendants' incubator, but the eggs are entirely removed from the incubator. The last three days are the hatching period, and not the incubation

period, which is concluded before the hatching operation is begun in defendants' practice. The hatching is performed by the defendants in a separate apparatus known as the "Separate Hatcher", which is not in communication with the incubator.

26. The District Court erred in its Opinion in holding that: "The patent is valid and infringed."

27. The District Court erred in ruling that, "The plaintiff may have an accounting for damages resulting from the infringement"; whereas Smith, the plaintiff, has no right of any character to recover where, as in this case, the defendants' incubators are of egg capacity of 16,500 or less; that phase of the use of the patent not belonging to Smith.

Wherefore, the defendants, James Manufacturing Company and Elmira Hatcheries, Inc., pray that said judgment and decree may be modified accordingly.

H. A. Toulmin, H. A. Toulmin, Jr., John S. Powers,
Counsel for Defendants.

Dayton, Ohio, August 13th, 1935.

[fols. 1582-1598] Bond on Appeal for $1500, approved and filed Aug. 13, 1935, omitted in printing.

[fols. 1599 & 1600] Citation, in usual form, showing service on Chas. A. Parker, omitted in printing.

[fol. 1601] UNITED STATES DISTRICT COURT

[Title omitted]

ORDER EXTENDING TIME TO FILE RECORD

Upon application of the defendants in the above entitled cause, it is hereby ordered that the time for filing the Transcript of the Record on Appeal herein in the Circuit Court of Appeals for the Second Circuit and the return day of

the citation issued herein is enlarged and extended to and including the 13th day of October, 1935.

John Knight, United States Judge.

[fol. 1602] UNITED STATES DISTRICT COURT

[Title omitted]

STIPULATION AND ORDER

It is stipulated between counsel for all the parties herein, subject to the approval of the court, that the time for filing the transcript of record on appeal herein in the Circuit Court of Appeals for the Second Circuit and the return day of citation issued herein is enlarged and extended to and including the 13th day of November, 1935.

A. L. Ely, Attorney for the Plaintiff. Toulmin & Toulmin, Attorneys for the Defendants.

Approved this — day of October, 1935. John Knight, U. S. Judge.

[fol. 1603] UNITED STATES DISTRICT COURT

[Title omitted]

STIPULATION

It is stipulated and agreed by and between counsel for the parties in the above entitled cause, subject to the approval of the Court, as follows:

1. That the time for filing the appellants' præcipe and statement of evidence required by Equity Rule 75, together with any objections which may be made, and/or amendments or changes which may be proposed therein, be and hereby is extended to and including November 1, 1935.

2. That the time within which plaintiff and appellee may file his præcipe indicating additional portions of the record desired by him, as provided in Paragraph (a) of Rule 75, be and hereby is extended to and including November 5, 1935.

[fol. 1604] 3. That the time for filing the transcript of record in the Court of Appeals and the return day of the citation be and hereby is enlarged and extended to and including November 30, 1935.

4. That the case entitled Smith vs. Hall now pending on appeal in the Court of Appeals for the Second Circuit, being a suit involving the same patent as that sued on in the above entitled cause, with the same counsel for appellee in both actions, counsel for the appellee in said case of Smith vs. Hall agrees to join with counsel for appellants herein in a request to said Court of Appeals to have the above entitled cause advanced on the Docket of said Court of Appeals, so that the said cases of Smith vs. Hall and Smith vs. James Manufacturing Company and Elmira Hatcheries, Incorporated, may be orally argued and presented to the said Court of Appeals at the same time.

James Manufacturing Company, by (Signed) Toulmin & Toulmin, Attorneys. Elmira Hatcheries, Incorporated, (by (Signed) Toulmin & Toulmin, Attorneys. Samuel B. Smith, by (Signed) A. L. Ely, Attorney.

Approved this — day of October, 1935. —— ——, U. S. District Judge.

[fol. 1605] IN THE UNITED STATES DISTRICT COURT

[Title omitted]

ORDER

Whereas it has been represented to this Honorable Court in the above entitled case that the trial engagements of Mr. A. L. Ely, principal attorney for the plaintiff in this case, will prevent his early consideration of the narrative statement of evidence filed in this case by the defendant's attorneys for approval, or the preparation of objections to the same, or the preparation of an amendment to the præcipe covering additional portions of the record which the plaintiff may wish to have included in the appeal record, within the time now set by stipulation, and the record and narrative statement of evidence in this case being volu-

[fol. 1606] minous, and there appearing no reason why the defendant will be materially damaged by the delay, and the request of the defendant appearing reasonable,

Now Therefore, upon the application of counsel for the plaintiff, as explained by the attached affidavit of Max D. Farmer, it is hereby ordered, adjudged and decreed that the time within which the plaintiff may file objections or amendments to the narrative statement of evidence in the above entitled case and within which the plaintiff may file amendments to the præcipe indicating additional portions of the record which he may desire to have included in the record, be and hereby is extended to and including November 15th, 1935, and that appellant's time within which to file the transcript of record, be and hereby is extended to and including December 15th, 1935.

(Sgd.) John Knight, U. S. D. J.

October 29, 1935.

[fol. 1607] In the United States District Court

[Title omitted]

Affidavit of Max D. Farmer

State of New York,
County of Erie, ss:

Max D. Farmer, being duly sworn, deposes and says:

I am attorney at law and one of the solicitors of record for the plaintiff in the above entitled case. I represent, as one of the local solicitors, Mr. A. L. Ely of Cleveland, Ohio, who is in direct charge of plaintiff's interests in the above entitled cause.

I am informed by Mr. Ely's office in Cleveland that Mr. Ely's present engagements include a trial at Grand Rapids, Michigan, which was scheduled to start on October 25th, another trial scheduled to start at Cleveland on October 29th [fol. 1608] which may last a week or more, and another trial scheduled to start at Kansas City, Missouri, on November 8th. I am also informed by Mr. Ely's office that the narrative statement of the testimony contains approximately 1323 pages which with a large number of the exhibits and a very

large record, will require at least several days of Mr. Ely's time to prepare his objections, and that Mr. Ely is unable to give the necessary time for this preparation until the conclusion of the trial scheduled to start at Kansas City on November 5th.

I am also informed by Mr. Ely's office that Mr. Ely is spending as much time on this matter as possible in order to expedite the same and in the letter to defendant's attorneys dated October 26, 1935, Mr. Ely supplied defendant's attorneys with his objections to the præcipe and informed them that if they would amend the præcipe as indicated in his letter, he would sign it, which indicates that Mr. Ely is doing all he can to expedite the completion of the appeal record, but that to compare a narrative statement of record of over 1300 pages with a large and voluminous trial record cannot be properly done within the time provided for by the stipulation.

The patent, having expired, no damage to the defendant will arise by reason of the extension of time in accordance with the attached order.

Max D. Farmer.

Subscribed and sworn to before me this 29th day of October, 1935. (Sgd.) Ponsy C. Hinchey, Notary Public. (Seal.)

[fol. 1609] IN THE UNITED STATES DISTRICT COURT

[Title omitted]

ORDER

Whereas it has been represented to this Honorable Court in the above entitled consolidated cases that the Court engagements of Mr. A. L. Ely, the principal attorney for the plaintiff in this case, and other legal matters which cannot possibly be postponed or delayed, have prevented full consideration of the entire narrative statement of evidence filed in this case by defendants' attorneys and it being apparent from the attached affidavit that the plaintiff's attorney will require at least until December 2nd to complete the checking of the narrative statement of evidence and the preparation of corrections and additions thereto, and the plaintiff's at-

torney having shown that he is proceeding with reasonable diligence by supplying his desired corrections and additions to the defendants' attorneys as rapidly as he checks the record and prepares his corrections and additions, and there appearing no reason why the defendant will be materially damaged by the delay, and the request of the plaintiff appearing reasonable,

[fol. 1610] Now Therefore, upon the application of counsel for plaintiff, it is hereby ordered, adjudged and decreed that the time within which the plaintiff may file objections, corrections or amendments to the narrative statement of evidence in the above entitled consolidated cases, be and hereby is extended to and including December 2d, 1935, and that appellants' time within which to file the transcript of record be and hereby is extended to and including January 2d, 1936.

(Sgd.) John Knight, U. S. D. J.

November 8, 1935.

IN THE UNITED STATES DISTRICT COURT

[Title omitted]

AFFIDAVIT OF MAX D. FARMER

STATE OF NEW YORK,
County of Erie, ss:

Max D. Farmer, being duly sworn, deposes and says:

[fol. 1611] I am an attorney at law and one of the solicitors of record for the plaintiff in the above entitled case. I represent, as one of the local solicitors, Mr. A. L. Ely of Cleveland, Ohio, who is in direct charge of plaintiff's interest in the above entitled cause.

I am informed by Mr. Ely that he is working on the checking of the narrative statement of evidence in the above entitled case as rapidly as possible and with all the time available outside of his essential court engagements, and has finished checking the first volume of the transcript of the record which includes page 462 and has submitted the corrections therefore to Toulmin & Toulmin, attorneys for defendants, so as to give the printer considerable material to

work on. Since the record contains over 1320 pages and since the corrections to the first 460 pages took over twenty legal size pages of corrections and additions, it is apparent that it will be impossible, even with diligent effort, to complete the narrative statement of record within the time now set, to wit, before November 15, 1935, and that it will require at least until December 2d to complete the checking of the narrative statement of the record and the preparation of the corrections and additions thereto.

The patent having expired, no damage to the defendant will arise by reason of the extension of time in accordance with the attached order.

Max D. Farmer.

Subscribed and sworn to before me this 8th day of November, 1935. (Sgd.) Mildred J. Pitman, Notary Public. (Seal.)

[fol. 1612] UNITED STATES DISTRICT COURT

[Title omitted]

PRÆCIPE

To the Clerk of the Court:

Now come the defendants in the above entitled consolidated causes and request that you prepare a transcript of record of said causes as consolidated and transmit the same to the United States Circuit Court of Appeals for the Second Circuit, on the appeal of the defendants therein, as soon as practical, incorporating and including in said transcript the following portions of the record:

1. The Bill of Complaint filed in Samuel B. Smith vs. James Manufacturing Company, Equity No. 253.

2. The Answer filed by the defendant in Samuel B. Smith vs. James Manufacturing Company, Equity No. 253.

3. Amended Answer filed by the Defendant in Samuel B. Smith vs. James Manufacturing Company, Equity No. 253.

[fol. 1613] 4. Plaintiff's motion for Bill of Particulars filed in Samuel B. Smith vs. James Manufacturing Com-

pany, Equity No. 253, omitting the part thereof under the heading "Remarks".

5. Answer of Defendant to Plaintiff's Motion for Bill of Particulars filed in Samuel B. Smith vs. James Manufacturing Company, Equity No. 253.

6. Amended Answers of Defendant to Plaintiff's motion for particulars filed in Samuel B. Smith vs. James Manufacturing Company, Equity No. 253.

7. Motion of Plaintiff for Supplemental Bill of Particulars filed in Samuel B. Smith vs. James Manufacturing Company, Equity No. 253.

8. Defendant's Response to Plaintiff's Motion for Supplemental Bill of Particulars filed in Samuel B. Smith vs. James Manufacturing Company, Equity No. 253.

9. Notice of Prior Uses and Publications Defendant will rely on and demand under Equity Rule 58, filed by the Defendant in Samuel B. Smith vs. James Manufacturing Company, Equity No. 253, omitting therefrom the publications of the article appearing in the February, 1912, issue of "Poultry Culture", the index cover page and pages 630 and 631 of the November, 1912, issue of "Popular Mechanics" magazine and the July 6, 1912, issue of "Electrical World", with the notation that these three publications appear as Defendant's Exhibits Nos. 23, 24 and 25, respectively.

[fol. 1614] 10. Stipulation consolidating the cases of Samuel B. Smith vs. James Manufacturing Company, Equity No. 253 and Samuel B. Smith vs. Elmira Hatcheries, Incorporated, Equity No. 254.

11. Stipulation filed in Samuel B. Smith vs. Elmira Hatcheries, Incorporated, Equity No. 254, agreeing to consolidate the two cases of Samuel B. Smith vs. James Manufacturing Company, Equity No. 253 and Samuel B. Smith vs. Elmira Hatcheries, Incorporated, Equity No. 254 and that the case will hereafter be entitled Samuel B. Smith vs. James Manufacturing Company and Elmira Hatcheries, Incorporated, Equity No. 253 and that the record on appeal may be limited as counsel may agree to the papers in one cause.

12. Stipulation filed on or about 23rd day of September, 1935, limiting the record on appeal to papers filed in the case of Samuel B. Smith vs. James Manufacturing Company, Equity No. 253.

13. Defendant's motion to dismiss the Bill of Complaint in this case.

14. Narrative Statement of Evidence.

15. Memorandum Opinion of Judge John Knight.

16. Findings of fact and conclusions of law by Judge John Knight.

17. Interlocutory decree filed on or about July 18, 1935.

18. Petition for appeal filed August 13, 1935.

19. Order granting appeal, fixing appeal bond in the amount of $1500 and directing suspension of accounting proceedings pending appeal filed August 13, 1935.

[fol. 1615] 20. Appeal bond approved by District Court filed on or about August 13, 1935.

21. Citation with acknowledgment of service thereon filed on or about August 13, 1935.

22. Assignments of error filed on or about August 13, 1935.

23. Order extending time for filing transcript of record and enlarging return day of citation to, and inclusive of October 13, 1935, filed on or about August 13.

24. Stipulation approved by Court further extending time for filing transcript of record and enlarging return day of citation to, and inclusive of, 13th day of November, 1935, filed on or about 5th day of October, 1935.

25. This praecipe.

26. Certificate of clerk as to correctness of record.

27. The following exhibits introduced in evidence before the District Court.

Plaintiff's Exhibits

1. Plaintiff's Exhibit No. 1, the Smith patent in suit, No. 1,262,860.

2. Plaintiff's Exhibit No. 3, heat graph of hatching egg.

3. Plaintiff's Exhibit No. 14, vertical cross-section of Jamesway machine.

4. Plaintiff's Exhibit No. 15, vertical longitudinal cross-section of Jamesway incubator.

5. Plaintiff's Exhibit No. 32, assignment from Buckeye Incubator Company to Samuel B. Smith.

[fol. 1616] 6. Plaintiff's Exhibit No. 33, license agreement between Samuel B. Smith and Buckeye Incubator Company.

Plaintiff's Exhibits—Continued

7. Plaintiff's Exhibit No. 34, contract between Samuel B. Smith and Buckeye Incubator Company.

8. Plaintiff's Exhibit I, being certified copy of abandoned Hastings application for patent that was formerly exhibit D-E, in the Cooley case.

Defendant's Exhibits

1. Defendant's Exhibit No. 8, File Wrapper of Smith patent in suit, No. 1,262,860.

2. Defendant's Exhibit No. 9, English translation of Stulik (German) patent No. 155,917.

3. The following patents from the volume of prior art pleaded, being Defendant's Exhibit No. 10.

(a) Woods patent, No. 656,760, dated August 28, 1900, also marking on this patent the following: "also introduced as Defendant's Exhibit No. 47".

(b) Goldstein patent No. 1,137,752, dated May 4, 1915.

(c) Meschter patent No. 347,946, dated August 24, 1886.

(d) Guerin patent No. 3,019, dated March 30, 1843.

(e) McAslan patent No. 540,107, dated May 28, 1895.

(f) Bell patent No. 691,837, dated January 28, 1902.

(g) Perkins patent No. 798,697, dated September 5, 1905.

(h) Peters patent No. 843,909 dated February 12, 1907. [fol. 1617] (i) Osborn patent No. 1,144,232, dated June 22, 1915.

(j) Fullington patent No. 1,205,445, dated November 21, 1916, marking on the same: "also introduced as part of Plaintiff's Exhibit No. 49".

(k) Gardner (British) patent No. 10,288 of 1887.

(l) Stulik (German) patent No. 155,917, dated November 11, 1904.

(m) Peck patent No. 917,483, dated April 6, 1909.

(n) Freas patent No. 1,165,958, dated December 28, 1915.

(o) Lumpp patent No. 280,490, dated July 3, 1883.

(p) Rogers patent No. 327,900, dated August 6, 1885.

(q) Verna patent No. 891,019, dated June 16, 1908.

(r) Bradley patent No. 934,274, dated September 14, 1909.

(s) Schmidt, et al., patent No. 1,010,809, dated December 5, 1911.

Defendant's Exhibits—Continued

(t) Proctor, et al., patent No. 432,282, dated July 15, 1890.

(u) Proctor Re-issue patent No. 11,460, dated December 25, 1894.

(v) Schwartz patent No. 535,175, dated March 5, 1895.

(w) Proctor patent No. 553,723, dated January 28, 1896.

(x) Winkler patent No. 286,756, dated October 16, 1883.

(y) Van Der Heyden patent No. 504,544, dated September 5, 1893.

[fol. 1618] (z) Schulze patent No. 101,168, dated March 22, 1870.

4. Defendant's Exhibit No. 12, magazine article entitled "Mammoth Incubator with Fans for Circulation of Air" by George F. Paul.

5. Defendant's Exhibit No. 16, circular of the Smith Standard Company.

6. Defendant's Exhibits Nos. 18-a, 18-b, and 18-c, drawings showing internal construction of James machine.

7. Defendant's Exhibit No. 19, chart showing constructions held as non-infringing machines.

8. Defendant's Exhibit No. 20, April, 1918, issue of "Reliable Poultry Journal".

9. Defendant's Exhibit No. 21, drawings of the Hastings incubator installed at Brooklyn, New York.

10. Defendant's Exhibit No. 22, Fig. 1 of drawings of Hastings-Muskogee 1911-1912 machine.

11. Defendant's Exhibit No. 22-a, Figs. 2, 3, 4 and 5 of drawings of Hastings-Muskogee 1911-1912 machine.

12. Defendant's Exhibits Nos. 22-b, 22-c, 22-d, 22-3 and 22-f, photographs showing views of Sirroco blower used in Hastings-Muskogee 1911-1912 machine.

13. Defendant's Exhibit No. 23, article in February, 1912, issue of "Poultry Culture".

14. Defendant's Exhibit No. 24, photostatic copy of index cover page and pages 630 and 631 of November, 1912, issue of "Popular Mechanics" magazine.

[fol. 1619] 15. Defendant's Exhibit No. 25, blue-print copy of July 6, 1912, issue of "Electrical World".

16. Defendant's Exhibit No. 26-a, typewritten article appearing on page 1 of the Hickox Album, introduced as Defendant's Exhibit No. 26.

Defendant's Exhibits—Continued

17. Defendant's Exhibit No. 26-b, photostatic copies of photographs appearing on page 82 of the Hickox Album, introduced as Defendant's Exhibit No. 26.

18. Defendant's Exhibit No. 26-*e*, photostatic copies of photographs appearing on page 84 of the Hickox Album, introduced as Defendant's Exhibit No. 26.

19. Defendant's Exhibit No. 26-d, photostatic copies of photographs appearing on page 86 of the Hickox Album, introduced as Defendant's Exhibit No. 26.

20. Defendant's Exhibit No. 26-e, photostatic copies of newspaper clippings, appearing on page 87 of the Hickox Album, introduced as Defendant's Exhibit No. 26.

21. Defendant's Exhibit No. 26-f, photostatic copy of photograph appearing on page 88 of the Hickox Album, introduced as Defendant's Exhibit No. 26.

22. Defendant's Exhibit No. 26-g, photostatic copy of photograph appearing on page 90 of the Hickox Album, introduced as Defendant's Exhibit No. 26.

23. Defendant's Exhibit No. 33, vertical longitudinal sectional drawing of James machine.

24. Defendant's Exhibit No. 34, vertical cross-sectional drawing of James machine.

[fol. 1620] 25. Defendant's Exhibit No. 37, circular of the Plaintiff on subject of separate hatchers and incubators.

26. Defendant's Exhibit No. 38, second circular of Plaintiff on subject of separate hatchers.

27. Defendant's Exhibit No. 39, Smith's circular letter to trade under date of October, 1930, on spread of disease.

28. Defendant's Exhibit No. 42, pages 12 and 13 of the January, 1932, issue, Vol. 7, No. 1, of the Smith House Organ "Smith Chickograms".

29. Defendant's Exhibit No. 43, copy of contract between Samuel B. Smith and the Buckeye Incubator Company on separate hatchers.

30. Defendant's Exhibit No. 49, being Defendant's patents; Fullington—1,205,445, Nix—1,548,478, Markey—1,751,093 Markey—1,796,872, Markey—1,837,458, Markey—1,939,908, omitting the Fullington patent No. 1,205,445, with notation that the same is incorporated with patents under Defendant's Exhibit No. 10.

31. Defendant's Exhibit No. 51, being tabulation by Dr. Greene from chart introduced as Plaintiff's Exhibit No. 3.

Defendant's Exhibits—Continued

32. Defendant's Exhibit No. 54, photograph of exterior of Smith machine and James incubator.

33. Defendant's Exhibit No. 55-a, photograph of Smith machine showing ceiling with three fans in normal position and fourth fan swung down.

[fol. 1621] 34. Defendant's Exhibit No. 55-b, photograph of Smith machine exterior with door open.

35. Defendant's Exhibit No. 55-c, photograph of Smith machine showing corridor with man standing inside.

36. Defendant's Exhibit No. 55-d, photograph of Smith machine exterior with door open.

37. Defendant's Exhibit No. 56-a, photograph of Smith machine with test holes in side and top candle blowing out.

38. Defendant's Exhibit No. 56-b, photograph of Smith machine with test holes in side and middle candle blowing out.

39. Defendant's Exhibit No. 56-c, photograph of Smith machine with test holes in side and bottom candle blowing out.

40. Defendant's Exhibit No. 57-a, photograph of James machine with test holes in side and top candle being sucked in.

41. Defendant's Exhibit No. 57-b, photograph of James machine with test holes in side and middle candle being sucked in.

42. Defendant's Exhibit No. 57-c, photograph of James machine with test holes in side and bottom candle being sucked in.

43. Defendant's Exhibit No. 58, photographs of prior art machines, Proctor patent No. 563,723, Schwartz patent No. 535,175, Goldstein patent No. 1,137,752, Stulik (German) patent No. 155,917.

44. Defendant's Exhibit No. 59, photographs of prior art patent machines and publications.

45. Defendant's Exhibit No. 66, pages 631, 632, 633, 634 and 641 of the February, 1926, issue of the journal of the [fol. 1622] American Vet-inary Association.

46. Defendant's Exhibit No. 67, summary page 23 and pages 46, 47 and 48 of the "Kansas State Agricultural College Bulletin" of November, 1926.

47. Defendant's Exhibit No. 70, page 232 of the book entitled "Development of the Chick" by Frank Lilly.

Defendant's Exhibits—Continued

48. Defendant's Exhibit No. 73, shodron report with turbulator running and not running.

49. Defendant's Exhibit No. 74-a, 74-b, 74-c and 74-d, Willett detail and diagrams of Smith new and old-style fans.

50. Defendant's Exhibit No. 75, comparative figures between Plaintiff's Exhibits 11-a, 11-b and 11-c and Smith machine produced by Dr. Greene.

51. Defendant's Exhibit No. 101, Zimmer patent No. 1,075,747.

The clerk will also please transmit to the Circuit Court of Appeals for the Second Circuit, as soon as practicable, the following exhibits introduced as evidence in the within cause as physical exhibits, not to be incorporated in the printed transcript of record.

Plaintiff's Physical Exhibits

1. Plaintiff's Exhibit No. 2, book of decisions on Smith patent.

2. Plaintiff's Exhibit No. 4-a, chart showing heat developed while incubating eggs.

[fol. 1623] 3. Plaintiff's Exhibit No. 4-b, photograph of apparatus used by witness Taggart in making heat demonstration.

4. Plaintiff's Exhibit No. 5, "Farmers Bulletin" #585.

5. Plaintiff's Exhibit No. 6, advertisement of Buckeye Incubator Company showing electro-type machine.

6. Plaintiff's Exhibit No. 7, advertisement of Blue Hen Incubator Company.

7. Plaintiff's Exhibit No. 8, bulletin entitled "Profit in Baby Chicks".

8. Plaintiff's Exhibit No. 9, operating book for Buckeye All-Electric Mammoth Incubator, 1931-1932 edition.

9. Plaintiff's Exhibit No. 10, book containing Defendant's Catalogs and Books of Instructions.

10. Plaintiff's Exhibit No. 11-a, drawing of the Smith incubator showing sectional view across the machine through the fan.

11. Plaintiff's Exhibit No. 11-b, drawing of Smith incubator showing a diagrammatic section along the corridor.

Plaintiff's Physical Exhibits—Continued

12. Plaintiff's Exhibit No. 11-c, drawing of Smith incubator showing a sectional view in plane parallel to corridor and midway between front and rear of trays.

13. Plaintiff's Exhibit No. 12, drawing of Buckeye incubator #48.

14. Plaintiff's Exhibit No. 13, photostatic copies of Buckeye catalog copyrighted in 1917.

15. Plaintiff's Exhibit No. 14, excerpts from testimony of Samuel B. Smith given in the following cases: Waxham vs. [fol. 1624] Samuel B. Smith, Ninth Circuit Court; Buckeye and Samuel B. Smith vs. Hillpot, No. 3697 and Hillpot vs. Buckeye, et al., No. 3698 in Third Circuit Court; Snow vs. Samuel B. Smith, No. 9757 in Eighth Circuit; and Wolf vs. Buckeye and Smith in Sixth Circuit Court.

16. Plaintiff's Exhibits 22-a, 22-b and 22-c, photographs of Jamesway machine with glass substituted on one of the doors for wood partitions.

17. Plaintiff's Exhibit No. 16, photographs of how anemometers were placed in tests made by witness Taggart.

18. Plaintiff's Exhibit No. 24, ten sheets or charts showing findings by witness Taggart on Jamesway machine in normal operation.

19. Plaintiff's Exhibit No. 25, series of tabulations of Jamesway machine with fan and air mixer not running compiled by witness Taggart.

20. Plaintiff's Exhibit No. 26, series of tabulations of Jamesway machine with air mixer running and fan not running compiled by witness Taggart.

21. Plaintiff's Exhibit No. 27, egg arrangement chart by witness Taggart.

22. Plaintiff's Exhibit No. 28, chart compiled by witness Taggart showing steps in process of hatching eggs.

23. Plaintiff's Exhibit No. 29, stipulation of numbers and value of machines sold by Smith Incubator Company and Buckeye Incubator Company compiled by Dorenkott.

[fol. 1625] 24. Plaintiff's Exhibit No. 30, bulletin entitled "Transmission of Pullorum Disease" by Agricultural Department.

25. Plaintiff's Exhibit No. 31, bulletin entitled "Sanitation in Hatcheries".

Plaintiff's Physical Exhibits—Continued

26. Plaintiff's Exhibit No. 100, certified copies of testimony of L. A. Cory, S. J. Anderson, R. Shanafelt, John G. Lieber, Huston A. Hogan and L. W. Pitts.

27. Plaintiff's Exhibit No. 101, photostatic copies of newspaper clippings.

Defendant's Exhibits

1. Defendant's Exhibits 1-7, inclusive, affidavits on Preliminary Injunction motion.

2. Defendant's Exhibit No. 13, book entitled "The Dollar Hen."

3. Defendant's Exhibit No. 14, book entitled "The New Egg Farm".

4. Defendant's Exhibit No. 15, catalogs of Smith Standard Company.

5. Defendant's Exhibit No. 17, Smith incubator Company large catalog.

6. Defendant's Exhibit No. 26, the Hickox Album.

7. Defendant's Exhibit No. 27, book by the Reamur, published 1750.

8. Defendant's Exhibit No. 28, catalog of Ira M. Petersime and Son.

9. Defendant's Exhibit No. 29, sketch of Hillpot machine drawn by witness Taggart.

10. Defendant's Exhibit No. 30, certified copy of record and briefs in case of Buckeye and Smith vs. Petersime.

[fol. 1626] 11. Defendant's Exhibit No. 31, record in case of Boliny vs. Smith in Sixth Circuit Court of Appeals.

12. Defendant's Exhibit No. 32, record in case of Smith, et al. vs. Blum in Sixth Circuit Court of Appeals.

13. Defendant's Exhibit No. 35, books, catalogs produced on Plaintiff's demand.

14. Defendant's Exhibit No. 36, Plaintiff's statement as to separate hatchers.

15. Defendant's Exhibit No. 40, Smith Company's Service bulletins numbers 1-100.

16. Defendant's Exhibit No. 41, Smith Incubator Company's catalog, F-40-47.

17. Defendant's Exhibit No. 44, Buckeye Incubator Company's letter of June 30, 1931, with attached illustrations of Buckeye separate hatchers.

Defendant's Exhibits—Continued

18. Defendant's Exhibit No. 45, Buckeye Incubator Company's catalog, copyrighted 1932, illustrating both incubators and separate hatchers.

19. Defendant's Exhibit No. 46, file wraper of Goldstein patent No. 1,137,752.

20. Defendant's Exhibit No. 48, prior art patents in case of Jones v. Cyphers.

21. Defendant's Exhibit No. 52, tabulation of comparisons between the Smith patent and James machine.

22. Defendant's Exhibit No. 68, note-book of Prof. Halpin.

23. Defendant's Exhibit No. 69, photostatic copy of title page and pages 178 and 179 of Dr. King's book, "Farmers of Forty Centuries".

24. Defendant's Exhibit No. 71, treatise on comparative embriology.

[fol. 1627] 25. Defendant's Exhibit No. 72 , Hatchery Code and Supplement.

26. Defendant's Exhibit No. 76, Smith testimony in case Smith, et al. vs. Cooley in Third Circuit Court of Appeals.

27. Defendant's Exhibit No. 80, affidavits of witness Taggart on motion for Preliminary Injunction.

Respectfully submittted, Toulmin & Toulmin, Attorneys for Defendants-Appellants.

Service of the above Præcipe and copy thereof is hereby acknowledged this 31st day of October, 1935.

—— ——, Attorney for Plaintiff-Appellee.

The plaintiff and appellee filed a counter-præcipe including all of the items called for in the præcipe of the defendants and appellants and also the following items and exhibits which are accordingly reproduced in this printed transcript of the record:

Plaintiff's Exhibit No. 4-a, chart showing heat developed while incubating eggs.

Plaintiff's Exhibit No. 6, advertisement of Buckeye Incubator Company showing electric-type machine.

Plaintiff's Exhibit No. 7, advertisement of Blue Hen Incubator Company.

Plaintiff's Exhibit No. 11-a, drawing of the Smith incubator showing sectional view across the machine through the fan.

Defendant's Exhibits—Continued

Plaintiff's Exhibit No. 11-b, drawing of Smith incubator showing a diagrammatic section along the corridor.

[fol. 1628] Plaintiff's Exhibit No. 11-c, drawing of Smith incubator showing a sectional view in plane parallel to corridor and midway between front and rear of trays.

Plaintiff's Exhibit No. 12, drawing of Buckeye incubator #48.

Plaintiff's Exhibit No. 24, ten sheets or charts showing findings by witness Taggart on Jamesway machine in normal operation.

Plaintiff's Exhibit No. 25, series of tabulations of Jamesway machine with fan running air mixer not running compiled by witness Taggart.

Plaintiff's Exhibit No. 26, series of tabulations of Jamesway machine with air mixer running and fan not running compiled by witness Taggart.

Plaintiff's Exhibit No. 27, egg arrangement chart by witness Taggart.

Plaintiff's Exhibit No. 28, chart compiled by witness Taggart showing steps in process of hatching eggs.

Plaintiff's Exhibit No. 29, stipulation of number and value of machines sold by Smith Incubator Company and Buckeye Incubator Company compiled by Dorenhatt.

Plaintiff's Exhibit I, being Exhibits D-D; D-H; and D-J of Cooley record (the remainder of said Exhibit I may be treated as a physical exhibit, except the copy of the abandoned Hastings application which is called for in defendants' and appellants' præcipe).

Plaintiff's Exhibit No. 100, certified copies of testimony of L. A. Corey, S. J. Anderson, R. Shanafelt, John G. Leiber, Huston A. Hogan and L. W. Pitts.

[fol. 1629] UNITED STATES DISTRICT COURT

[Title omitted]

STIPULATION

It is hereby stipulated and agreed, that the foregoing (in 3 vols.) is a true transcript of the record of the said Dis-

trict Court in the above entitled matter as agreed on by the parties.

Dated December —, 1935.

A. L. Ely, Attorney for Plaintiff. Toulmin & Toulmin, Attorneys for Defendants.

[fol. 1630] Clerk's certificate to foregoing transcript omitted in printing.

[fol. 1631] UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SECOND CIRCUIT

SAMUEL B. SMITH, Plaintiff-Appellee,

against

JAMES MANUFACTURING COMPANY and ELMIRA HATCHERIES, INC., Defendants-Appellants

OPINION

Before Manton, Swan and Chase, Circuit Judges

Appeal from the United States District Court for the Western District of New York. Suit for infringement of patent. Decree for plaintiff; defendants appeal. Reversed.

Albert L. Ely, Esq., Max D. Farmer, Esq., Attorneys for Appellee. Parker, Prochnow & Farmer, Esqs., of counsel.

J. S. Powers, Esq., H. A. Toulmin, Jr., Esq., H. A. Toulmin, Sr., Esq., Counsel for Appellants.

MANTON, Circuit Judge:

This suit is for infringement of Claims 1, 2, 3 and 5 of the Smith patent No. 1,262,860, for an incubator granted April 16, 1918, on an application filed October 26, 1916. Claim 1 has been held invalid in Smith v. Hall, decided this day. Claims 2 and 3 are similar method claims and fall for the same reasons as Claim 1. With the method claims invalid, there is nothing in claim 5 covering the apparatus [fol. 1632] to apply the method to support an infringement suit.

Decree reversed.

[fol. 1633] UNITED STATES CIRCUIT COURT OF APPEALS, SECOND CIRCUIT

[Title omitted]

DECREE—April 13, 1936

Appeal from the District Court of the United States for the Western District of New York

This cause came on to be heard on the transcript of record from the District Court of the United States for the Western District of New York, and was argued by counsel.

On consideration whereof, it is now hereby ordered, adjudged, and decreed that the decree of said District Court be and it hereby is reversed with costs.

It is further ordered that a mandate issue to the said District Court in accordance with this decree.

Wm. Parkin, Clerk.

[fol. 1634] [File endorsement omitted.]

[fol. 1635] Clerk's certificate to foregoing transcript omitted in printing.

[fol. 1636] SUPREME COURT OF THE UNITED STATES

ORDER ALLOWING CERTIORARI—Filed May 25, 1936

The petition herein for a writ of certiorari to the United States Circuit Court of Appeals for the Second Circuit is granted.

And it is further ordered that the duly certified copy of the transcript of the proceedings below which accompanied the petition shall be treated as though filed in response to such writ.

[fol. 1297] In Supreme Court of the United States, October Term, 1936

No. 36

Samuel B. Smith, Petitioner,

vs.

James Manufacturing Company and Elmira Hatcheries, Inc., Respondents

Stipulation for Correction of Record—Filed September 28, 1936

It appearing that there are certain errors in the Record in the above entitled case which counsel desire to have corrected, it is hereby stipulated and agreed that the Clerk may correct the Record in the following particulars:

1. On page 574, in the quotation from the "Boston Sunday Globe", the phrase "At Port O'Connor with more eggs and more funds at his command" should be corrected to read—At Port O'Connor with more experience and more funds at his command—

2. Page 15 of Exhibit 23, being a part of the reproduction of a publication from "Poultry Culture", has been omitted. The Clerk is requested to reproduce this page and insert it at the proper point in the Record. A photostatic copy of the missing page is attached hereto.

A. L. Ely, Attorney for Petitioner.

Cleveland, Ohio, Sept. 23, 1936.

Toulmin & Toulmin, Attorneys for Respondents.

Dayton, Ohio, Sept. 24th, 1936.

...ber suggestion. Cold weather has no perceptible effect upon the temperature. The third batch was made during the present blizzard.

Although temperature and humidity controls were convincing to the investor, the Muskogee public waited dubiously for Mr. Hastings' first batch and it was not until 104 lively youngsters broke forth from 100 fertile eggs, (200 placed in machine) that local faith in the big incubator became general. Our last report finds 180 of these chicks 3 weeks old and without an ailing one in the flock. The week or deductive numbers having been killed during the first three days and now shows growth in a water pail.

Judged by present indications, the writer believes that the Hastings Hatchery is destined to mark the most significant step in the development of the poultry industry since the invention of the lamp heated incubator.

This prediction is based upon three facts. First, the immense economies in the cost of hatching. Second, the better facilities for applying the known principles of incubation. Third, the indisputable and opportunities offered for the further investigation of the science.

Mr. Hastings contends that our progress thus far has been woefully handicapped by too close a worship of nature as a perfect guide. "Not only," he tells us, "have we looked to the setting hen for all our tips on incubation, but we have assumed that our ultimate goal was to equal her work. The hen's natural

A Single Comb Rhode Island Red of unusual color and shape.

end the breeder have no such respect for Nature but rather considers it their particular business to improve upon Nature and patch up her defects. The true solution studies Nature, but he only imitates her when he cannot improve her. The hen has certain facilities and habits that help her hatch eggs and certain limitations that prevent her from hatching them better. We want to begin where she leaves off and we have an right to say we have a science of incubation when we can get more chicks and better ones from a given lot of eggs than any group of setting hens in existence. Until that time we are but thumbed imitators."

The Hastings Hatchery offers the first real opportunity for full control of the various factors of incubation which make possible a complete study of the principles involved. Not the least of its practical advantages for experimental work is the fact that the hatchery is manned and can be regulated for temperature and humidity so that the attendant works with the chick or egg without subjecting it to abnormal conditions. Certainly with such equipment, opportunity exists for some first class poultry research work.

If the Muskogee plant continues to do good work during the present season, Poultry Culture will advocate a Hastings Hatchery as a feature of the Kansas Agricultural college's new poultry department for 1913. Certainly no more fitting institution could be found to take up this work, for Mike Hastings conceived the first rough idea of his present achievement while poultryman at the Station seven years ago.

Teacher—Johnny, what is an octogenarian?

Johnny—Pa says that it's one that can eat eggs three times a day at the price they are.

"THE CORNING EGG FARM BOOK
By Corning Himself"

Not a Dream of Some Would-be Successful Poultryman;

No Theoretical Possibilities;

But Actual, Accomplished Facts.

The Straight-Forward Story of the Building up, in Five and a Half Years, of the Greatest Egg Farm in the World, from a Start with only 50 hens.

The Corning Method developed the Strain of Single Comb White Leghorns, which cannot be surpassed.

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The marvelous discoveries, and far-reaching developments in feeding for eggs, which have been made on the Corning Egg Farm during the last two years, can be found only in The Corning Egg Farm Book, because no one has gone into feeding for eggs as thoroughly and as successfully as Corning.

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The Corning Method brings success to the man who keeps a few hens, in the back yard, just as surely as to the man who keeps hens by the hundreds and thousands.

The Corning Egg Farm Has Now Surpassed $6.41 Per Hen Per Year

and The Corning Egg Farm Book by Corning Himself, tells how you can do the same. How to build the Corning Houses, detailed drawings, lists of required materials, with full instructions, are in the Book.

Remember, Corning designed and built all these houses. No builder, architect, or contractor could give you such plans, as only Corning knows.

The chapter covering the handling of birds on Colony Range will help many a man to put more profits into his laying hens than he has ever done before.

Mortality in raising chicks can be materially lessened by following the instructions laid down in the Corning Egg Farm Book.

This Book is a real book, not a cheap, paper pamphlet. It is bound in rich, blue cloth, stamped in gold, with the Corning Strain Utility Cockerel in colors. 216 pages of clear type on fine paper. A Corning Cockerel, painted by one of New York's foremost artists, in life colors, is the frontispiece. The pictures, 36 in number, were taken by a photographer of reputation. They are half-tones, full page, and large. 20 pen-and-ink drawings cover plans of buildings, etc.

The Strain That Makes The Corning Egg Farm Famous.

No one else can offer you the equivalent of The Corning Egg Farm Book at any price, for the particular reason that the knowledge given in plain language, understandable and usable by anyone, has been thought out, worked out, and perfected by the Cornings, the experiments are left for others. The Secrets of the Corning Method, as told in this Book, means success and profits. Price, $1, postpaid, to any address.

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GREAT WIN AT PHILADELPHIA, PA., DEC. 12-16, 1911.

In Rose Combs: 1, 2 cks.; 1, 2 cbl.; 1 pen; 2, 4 pul.; 4 hens. Specials for best 4 birds, pair cocks, best colored male and female, best shaped male. In single Combs: 2d hen and 2nd ck. At Augusta, Ga., after a long, hard trip, won on Rose Combs: 1 ck.; 1, 2 hens; 1, 2 pens; 2, 3, 4 ckls.; 3, 4 pul., color and shape specials and five gold specials, and 4 pieces on Single Combs.

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Seaman & Bogart **R. R. 71** **Port Washington, N. Y.**

Here is hoping that this year your poultry will take a big stride forward in the right direction. And while we are hoping let's not forget that right actions on our part are powerful stimulants in the right direction towards accomplishing this.

It should be gratifying to poultrymen to note that that unfortunate poultry grain, Kaffir corn, has finally aroused enough interest to have a substitution to honor it for the first time. And it has done it in fine style, the county and state of Butler county, Kansas, had a three-days' celebration in October. Here it was used in decorative and arrange into all sorts of fantastic and pretty designs. Truly old King Corn will have to look more carefully to his laurels or Prince Kaffir, who is the late approval will be crowned and placed on his throne.

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